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Charles Atwood Kofoid

STERILITY AND
CONCEPTION

SCHEMATIC DRAWING SHOWING DIFFERENT POINTS WHERE CONCEPTION TAKES PLACE.

A., ovum. B., spermatozoa. 1, tubal conception. 2, uterine conception.
3, ovarian conception. 4, abdominal conception.

STERILITY AND CONCEPTION

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PREFACE

The following study of sterility and some of its allied conditions is undertaken in the hope that it may help thoughtful students to attain at least a comprehensive knowledge of this most important subject. It is intended as much for the general practitioner, to whom these cases as a rule first apply, as for the specialist, but it is the latter, however, who should constitute the court of last appeal and sit in final judgment on the respective merits of each case.

It is most unfortunate that the great progress of theoretical knowledge in recent times has not always been accompanied by a corresponding advancement in practical interpretation and we have, therefore, to admit that a great deal of what is to-day called "exact science" is still very far from being such.

The vast extension of medical knowledge in the past fifty years, which has been made possible only by a division into specialties, has rendered it nigh unto impossible for one mind to cover the whole field of medicine with equal thoroughness. My own command of the various branches of medicine is uneven and defective and, even were I largely endowed with the artistic faculty of comprehensive presentation, I should still be unable to write a complete treatise on sterility.

To-day, more than ever before, woman is called upon to play a most exacting rôle in life and one in which the question of mental capacity has assumed a very great proportion. At times it takes such precedence over almost everything else, even to the extent of completely overshadowing all consideration of her physical well-being, that it is quite possible to suppose at some time in the future, should this continue, there might develop a race of women who would be such in little else but name. This could only be brought about, however, at the expense of their child-bearing function and, if they should thus refuse to breed, or succeed in making breeding a physical impossibility, then would come the end of the race.

We are facing at the present time in the United States a higher rate of sterility and a lower rate of fertility among our native-born women than is any other civilized nation; the estimated rate of sterility

for all classes being between twenty and twenty-five per cent, while the number of those absolutely sterile is about twelve per cent.

Accompanying this steady increase in sterility, there has also been a proportionate decrease in fertility in almost every civilized country in which records are available, so that woman's progressive unfruit-fulness is really a question of world-wide importance. In the United States, the increase in sterility and the decrease in fertility has developed much more rapidly than in most other countries. While it has been estimated from reliable sources that the rate of fertility in the United States, at the close of the eighteenth century, was five children to a marriage, no such favorable conditions exist any longer. In one century our rate of sterility has mounted from two to over twenty per cent, making us the least fertile of the civilized countries, speaking of native-born and not immigrant classes. Thus we present the truly appalling condition where our sterility is far greater and our fertility much lower than any time in the history of the nation.

The existence of such a condition as this is of sufficient serious-ness to call imperatively for a remedy, and it is only by giving the subject the serious consideration and wide publicity which it deserves that we can hope to bring to the people a realizing sense of the ominous fact that, unless they wake up, they will be called upon to face race extinction in the comparatively near future.

In the present monograph, I have, with full realization of its many shortcomings, given an exposition of the problem with the en-deavor to help in the treatment of this growing social blight so vitally concerned with the welfare and survival of the race.

CHARLES G. CHILD, JR.

NEW YORK CITY

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Marital unfruitfulness has always been considered by a majority of the world's people as a great misfortune, and in ancient times even as a curse. Upon the unhappy woman was usually placed the blame, although it was generally believed that her fruitfulness or unfruitfulness depended upon the will of God. Among most people of the earth to-day, children are considered as a blessing much to be desired and fertility the greatest of matrimonial luck. It is only by a comparatively few that fertility is not held in the highest esteem, and these profess to hold great fruitfulness as contemptible and to be relegated to the animal kingdom.

A fruitless union is one of Nature's saddest tragedies. From whatever point of view it be considered, the result is detrimental to the best interests of society. Granted that occasional exceptions to the rule may be encountered, they are few and far between, and are usually dependent on chronic disease of one or both parties that only too often was prenuptial and should have prohibited union in the beginning. Seldom, if ever, is a childless marriage a happy one, and only too often the sterility becomes a disruptive factor destroying the very integrity of the household. The man with his many outside interests is better able to stand the monotony of a childless home during the comparatively few hours he spends within it than is the

woman. She, be she worthy of the name, has of necessity, if not from actual desire, to spend a greater part of her time in domestic duties and has no such daily outside diversions as has the man.

Nature in her infinite wisdom has provided every woman from the time of her birth with a maternal sense and desire for children. This is satisfied during her childhood by countless dolls upon which she lavishes untold care and affection, even into advanced puberty, but as maturity is reached, these no longer satisfy the woman and the longing for real motherhood asserts itself. If this natural, maternal longing is not gratified, her very nature will frequently become changed and her mind take various abnormal slants that are hardly conducive to her happiness, or to the happiness of those around her.

As woman possesses certain organs, and plays a part in life peculiarly her own, we should naturally expect to find her subject to certain diseased conditions more or less dependent on her anatomy, physiology, and mode of life. These I shall later sum up, for the purpose of brevity, under civilization with its attendant evils, and childbirth.

In our present highly organized, or disorganized state of society, incapability of reproduction has become of such common occurrence as almost to lead one to believe that it is a necessary evil of our higher civilization. The very social life, the mental and physical training of our young girls at the present day, especially those brought up in cities, are hardly calculated to develop later on a high degree of fertility, but we are fast becoming a nation of cities, and must face the inevitable. The U. S. Census Bureau Report for 1920 gives the urban population as 51.4 per cent of the total population of the country. Our future civilization is bound to be urban, and the problem of an increasing rate of sterility must be met and remedied; otherwise we shall perish from the land.

In early times the people gathered chiefly in cities for temporary reasons. They sought protection from marauders, which the walled town afforded, going out each day into the surrounding fields to work. City life was then a necessity, sought only for mutual protection at night. During the day the work was out in the open and all had an equal opportunity for healthy, outdoor exercise. How different is the condition to-day!

In a more or less ideal state of society, mating would take place early in adult life and it would be the desire of the parents that their children should marry early and produce in their turn many healthy

children to be brought up as useful citizens. We are, however, dealing not with the ideal but with a society cursed by many man-made social conditions which make early marriage at the natural age impossible for most young people. As a result of this, irregular unions occur and conditions of life develop which lead only too often to immorality and to prostitution. All of these unnatural social restrictions impose a limit upon the perfect freedom which exists in the primal marriage.

To-day urban life is permanent, and the city is sought for its attractions; greater human intercourse, multiplied conveniences, superior educational advantages, amusement, excitement and endless variety of happenings, all of which appeal only too strongly to the average human being, while the dominant influence with many is the great opportunity to make money, or what is probably equally as bad, to spend it. The natural trend of all this is to produce congestion, misery, and selfishness; to substitute an unnatural, unhealthy mode of life for a natural, healthy one such as Nature intended her children to live. The old gospel of "Be fruitful; multiply, and replenish the earth" has been superseded by a modern creed of "Practice birth-control and enjoy yourself."

Modern Civilization and Birth Control.—The rapid growth of modern civilization has given birth to many marvels, some good and some bad. Undoubtedly one of its saddest spectacles is the unprecedented and disproportionate development of materialism with all of its consequent demoralizing effects upon the individual.

If the child grows in body, but not in mind, it becomes an idiot. If it develops physically and mentally, but not morally, it becomes a criminal. If the woman develops physically so that she is capable of reproduction, yet with a moral growth so stunted that she refuses under proper conditions to undertake the cares and responsibilities of motherhood, she is a criminal against society and a drag on the nation. The comparatively recent athletic tendency among women is admirable and has resulted in much good to her sex from a physical standpoint, but we should remember that it is often possible to develop the lower life at the expense of the higher. The golf or tennis champion, as an animal, may be admirable; as a woman, she is often monstrous.

Reproductivity and the Educated Classes.—The higher education of women has marked inhibitory effects upon their reproductivity, and the proportion of female college graduates who marry is less than fifty per cent. Our young girls are sent early to school and subjected

daily to long hours of study, often in badly ventilated classrooms, for nine months in the year, and this at the time of puberty, one of the most important periods of their life, when they need the greatest outdoor freedom and exercise. Later comes the high school and college with their increased mental strain and competition, and finally marriage, when only too often she is hardly more than a mental and physical wreck. Surely as Goodell has said, "If woman is to be thus stunted and deformed to meet the ambitious intellectual demands of the day; if her health must be sacrificed upon the altar of her education, the time may come when, to renew the worn-out stock of this Republic, it will be necessary for our young men to make matrimonial excursions into lands where educational theories are unknown."

Even a most casual glance into the system of education of our women of to-day cannot but disclose that there is something radically wrong with its teachings, and that we are far from solving, or even beginning to solve, the question of how properly to educate our women. Co-education has a great deal in its favor and is worthy of a more extended trial, for the intense asceticism of our present educational system is accompanied by a great deal that is bad. While it may be necessary to some extent for the woman to keep pace with the everyday social demands which civilization has thrown upon her, it is hardly calculated to bring about a calm, peaceful poise so necessary to enable her to carry out to best advantage the demands made upon her womanhood.

So much is heard to-day of "woman's sphere," "her place in the world," and her "career," that it is interesting in this connection to stop and seriously consider what careers are really open to her. On first sight, the field would appear to be very limited. She may take up writing and become an authoress or she may decide upon a teaching career in either school, college, or the arts. Again, she may enter politics. These are all worthy pursuits and, when conscientiously carried out, may lead to gratifying results.

But if her brain is developed at the expense of her body, and her studies take up the time that should be given to exercise or repose, and if we add to this a strong ambition to rival or excel her male companions, the result is apt to be disastrous. With her energy bent upon mastering mathematics or the classics; with her spare moments devoted to collateral reading; with her out-of-door life and exercise entirely neglected; it is not surprising that her physical system often breaks under the strain. The pernicious régime begun at school is carried

through into college life with even more disastrous results. Finally, graduating with high honors, often a recognized authority in some particular line of research, she is but a physical wreck.

Then comes a period, often of even higher mental pressure, until she marries. The married life is usually a sterile one, either from acquired or self-imposed conditions. It is among college graduates that the highest percentage of sterility, twenty-five to thirty per cent, exists to-day.

A social career, although widely different, is yet attended by evils almost as great as that of higher education. There is nothing that so unfits a woman and makes her so discontented with her own home and surroundings, as the continual whirl and excitement with which society supplies her. The constant round of festivities day and night is a strain which few women can stand for any length of time without breaking down. Late hours night after night, overeating, overdrinking, with a freedom of intercourse between sexes not always gratified by legitimate congress, bring about a rapid moral and physical degeneration that is little less than appalling.

The state is far from fulfilling its obligations to the parents, and especially to the mothers. Every effort should be made to give her, during her pregnancy, in child-bearing, and child-rearing, the necessary physical, moral, and medical help; for upon such help depends, to a great extent, the future well-being of our land.

Sterility among Native Born.—Immediate steps must be taken in the interest of self-preservation; for with a high and increasing rate of sterility among our native-born, and a birth rate only kept up by the immigration of more fertile races, the United States faces a great crisis to-day. Among our native-born, sterility is increasing and fertility decreasing; there is an ever-growing desire to avoid parenthood; and we are being outbred by the immigrant races. Restriction of immigration, intelligent governmental help to parents, reduction in the preposterously high cost of living must soon be accomplished facts if a truly American race is to survive, for to-day the native born American belongs to a vanishing race.

Nothing has as yet been effectively done by legislation to lighten the burden of large families. The meager allowance made by the State to the income-tax-paying class, of two hundred dollars deduction for each child, is totally inadequate, and a liberal endowment of motherhood in all classes is urgently needed. The taxation of unmarried adults has much to be said in its favor, and a great deal could be

done by a wise Government towards relieving the financial burdens of fathers and mothers of families, especially in their early stages. Every help should be given to women in the performance of those duties which are their natural inheritance.

A study of the abnormal conditions of modern life will show many evils responsible for the increase in sterility, and just where the remedy is to come from, it is even difficult to surmise, but the desertion of the land for the cities, so steadily progressive almost from time immemorial, would seem to indicate that it is in the cities that the race will eventually perish.

Modern materialism is preëminently the peril of the American family, for it leads among all classes to a restriction in the size of the family. This growing materialism must be met and fought at every turn. It has so conquered the life of the city that the hope of the future lies in the country and suburban districts. As the cities grow more populous, the people are packed into closer quarters, herding together in hotels and tenements to the marked detriment of the home life. Among the rich, hotel and club life has all but displaced the home life, while among the poor, rent increase has forced them into such cramped quarters that home life is out of the question. As Henry George has said, "The proportion of births is notoriously greater in new settlements, where the struggle with Nature leaves little opportunity for intellectual life, and among the poverty-bound classes of older countries, who in the midst of wealth are deprived of all its advantages and reduced to all but an animal existence, than it is among the classes to whom the increase of wealth has brought independence, leisure, comfort and a fuller and more varied life." This fact was long ago recognized in the homely adage, "A rich man for luck, and a poor man for children."

All possible effort should be made to help the working class, especially the better educated, who have a real interest in the future of the country, but, where living on meager, fixed incomes, their actual economic position is below that of the lower working class, even that of the manual laborer. The State should look upon every potential parent as a real and valuable national asset.

In the days of large families there was a wide margin to allow for accidents, so that careful nursing was of minor importance; but while economical reproduction with an increase in parental care is of the greatest importance, probably a greater asset to a race than a high rate of fertility, it should not be carried beyond a point where the reduction

in the number of offspring is not fully compensated for by the correlated reduction of infant mortality. If we infer from analogy, then what has probably occurred in the process of evolution is, that the advance made in the social scale has been associated with a very marked reduction in reproductivity.

Man and higher vertebrates are on a constantly increasing scale of economized reproduction and elaborated parental care. Herbert Spencer, in his "Principles of Biology," reached the conclusion that genesis decreases as individuation increases; the two varying in inverse ratio. So little is known regarding the physiology of fertility and of nonpathological sterility, that it is difficult to form a correct opinion as to the extent to which the higher individuation directly affects fertility, but that it is a factor to be reckoned with seems highly probable.

The average size of the family is small among educated people where acquired individualization is best seen. In the families of college graduates and so-called gentle people, in the United States the rate is less than two children to a union. With the highly individuated late marriages, marriages of convenience rather than love matches, the deliberate evasion of parentage contributes largely to a reduction of fertility. Multiplication is affected more or less indirectly by improved social conditions; new interests in life have a diverting effect upon the animal nature. There is a constantly increasing type who, with strongly inhibited sex impulses, are either constitutionally sterile or only relatively fertile. Dr. Millard says, "It appears that poverty, degradation, inefficiency, ignorance, overcrowding, almost everything, in fact, that human judgment tends to disqualify for parenthood, are just the factors nowadays which too often co-exist with large families." The Registrar General for England has made the important statement that "not more than seventeen per cent of the decline in the birth rate can be accounted for as abstinence from marriage, but that nearly seventy per cent of the decline in birth rate must be ascribed to voluntary restriction."

Sterility in the Middle Classes.—The percentage of sterility in the middle classes is much higher than in the class of manual workers, and among the latter the upper working classes show a higher rate than the lower. It is thus quite apparent that those classes which in the past have shown the greatest ability in the struggle for existence, by rising in the social scale, later fail to discharge their debt to posterity.

Voluntary restriction of the birth rate for dysgenic reasons enters very largely into this question. The present-day attitude towards large

families is changed and in many households marriage is little more than legalized prostitution. So frequently am I consulted by young married people, and even by those contemplating matrimony, for instructions in methods of contraception that I have many times to blush in very shame for my country.

To obtain the best that is in the individual and for the continued advancement of the race, purely sexual intercourse must be subordinated to the great call of parenthood, and not the reverse. When a couple enter into the marriage state, they should accept willingly, hopefully, and with a full realization, all of the responsibilities of common parenthood.

At a time when large families were the rule and not the exception as at present, Nature ruled and women bore children whether or no, so that the population increased as God intended it should. In comparatively recent times the death knell of race advance, with "birth control" pulling strongly on the bell rope, has sounded. It is now not only among the educated and professional classes where it originated that birth control is practiced, but it has spread like wildfire throughout all classes until "race suicide" is now well under way.

Twenty years ago, on my service at the City Hospital, the admissions to which come from a large area populated by the middle and lower class of manual workers, it was a rare occasion to admit a woman suffering from a criminally induced abortion. To-day my wards are often crowded by this class of patients, on many of whom the abortion was self-induced.

Eugenics and Birth Control.—Eugenically speaking there is much to be said in favor of birth control as a therapeutic measure, and there should be no foolish scruples about interrupting a pregnancy when its continuance would involve severe maternal risk. I am also fully alive to the dangers and uncertainties of child-bearing and thoroughly appreciate that the nursing and rearing of the child are full of tedious and anxious moments, but the whole subject deserves a wider consideration from its economical, social, and ethical side than it is possible to devote to it in a book of this character.

There can be but little doubt in the mind of anyone to-day that the gospel of sex hygiene needs to be widely preached by those in authority and not left to the hysterical outbursts of ignorant fanatics. To every young person, at a suitable age, should be taught the virtue of sex morality and the sins of sex immorality; the widespread prevalence of venereal diseases and their menace not only to the individual

but to the marriage state. All should be instructed in the immorality and danger of criminal interference with pregnancy and given a thorough understanding of the responsibilities of parenthood with the inestimable value of the home life to the nation and to the race.

From whatever point we study the evolution of the world, the development of life from a racial standpoint, reproduction, and the relation of parenthood must ever be kept in the foreground. It is a very vital and necessary factor in all sexual associations and is a primary, if not exclusive, purpose. As a moral function, it cannot be suppressed or disregarded without producing physical injury and social unbalance.

FAMILY DECREASE

The decrease in the size of the family is very materially contributed to by the increasing economical difficulties of the great mass of the populace. It is on every hand quite evident that as the scale of prosperity ascends, the size of the family descends, and that whatever social conditions bring a class into a sphere into which they hope to rise or fear to fall, the lowering of the birth rate in that class inevitably follows; for a higher standard of living with its increased cost of maintenance brings with it a taste for the delusive pleasures of a life of idleness and luxury which first points the way to the practice of birth control. By a life of luxury and ease the strength of the reproductive force in man is greatly weakened. Man is an animal, to be sure, but an animal plus something more. Unlike the animal, his wants are never satisfied and when once he sets his foot upon the first rung of the ladder of infinite progression, nothing will hold him back. As the power to gratify his wants increases, so does his ambition grow and the animal instincts within him, satisfied with only what is necessary for its consumption, are crowded to the wall. Feverishly he renews his attacks upon the world, attempting to wrest from it more than he needs, more than he can ever use, and in many instances, more than he can ever even later intelligently give away. To such a one a large family is a decided encumbrance, and it is hardly to be wondered at that for him a declining birth rate holds little terror and the question of assuring the perpetuation of the race but little interest.

We often hear the expression "a woman's sphere" spoken of as if it were something dishonorable and entirely unworthy of the present-day woman. It is to be regretted that such an honorable state should

be often derided and ridiculed. There are, of course, many spheres of usefulness for women as well as men, but there are certain fields for which she is preëminently fitted and in which she conspicuously shines. When we consider the great physical difference between the sexes and the special functions which each sex is called upon to maintain, it would appear quite easy to understand that such marked sexual characteristics as distinguish between man and woman would of necessity limit each to their own vocations.

While it is not to be denied that woman may, and at times does, excel in many walks of life which by training and physical development might be called masculine, and while it is likewise true that men oftentimes excel in those pursuits or vocations supposedly feminine, these examples are as a rule abnormal and are not to be admired or sought after. The woman lawyer and the man cook belong in the class with the short-haired woman and the long-haired man. Neither sex can with safety disregard the physical demands made upon them, and this is particularly true of woman. When she ignores her sex characteristics, she suffers to a greater extent than the male, and such divergence has a very marked effect upon her progeny both in quality and quantity. If her mind is constantly preoccupied by cares of state or by the mental excitement and mental trials of business, or any other occupation which tends to unsettle the proper balance between mind and body, she will not be able to become a mother of healthy children.

When woman attempts man's functions she proves to be but an inferior man, and the masculine woman is one of the monstrosities of nature. To attempt to change woman into half-man and half-woman, a hybrid competing with, rather than supplementing, man, is to attempt a "reform against nature" as Horace Bushnell has truly said, and I hardly believe the time will ever come when the line of demarcation between the functions of the sexes will be abolished, for such would certainly be a most disastrous step backward in the march of social progress.

CREATIVE AND DEVELOPMENTAL DIFFERENCES OF SEX

The sexes show marked creative and developmental differences, and it is only when working together, each in his or her own sphere, and not in competition, that the best results are obtained. There should be no question raised of superiority, inferiority, or equality, for

each is superior in his or her own sphere, and both are essential to life. There should be a greater interest in legislation for the protection of women in their legitimate sphere; for motherhood, both potential as well as actual, must be protected if the race is not to perish.

Too much attention has been directed to legislation designed to give women special privileges outside of their own sphere, enabling them more successfully to compete with men in theirs. It has been urged that in this way would be brought about the reform of the race. But if woman is to save the day and make a better world, it will be not in politics and business, but by the side of the cradle, in the nursery, in the school, in the church and around the family fireside.

There can be no denying the fact that higher civilization with its increasing materialism is very hard on woman, and it is devoutly to be hoped for that this fact may be more generally recognized before it is too late. The tendency of higher civilization is to place woman upon a high pedestal, made up of luxury, idleness, and ease, the attendant evils of which she has not apparently as yet realized.

While every effort has been made to take her out of her legitimate sphere, no effort has been made to supply the void which this has created. She is to-day only too often driven by ambition towards goals which she can never reach because they are physical impossibilities for her sex. Thus stimulated to efforts beyond her strength, she is reduced to a condition of nervous unrest that has lost to her that tranquillity which means so much when it comes to a question of bearing children.

If we cast but a casual glance through the animal kingdom, we find that in all forms of animated nature, repose is necessary for the carrying out of any serious work, and this is particularly important for a woman during her reproductive period when she is concerned with keeping alive the race.

The rapid march of progress in certain lines during recent times leaves to-day very little opportunity for one to sit down quietly and adjust oneself to the constantly varying environment, and these incidental strains of everyday life tell more heavily on the woman than they do on the man. Man has been fairly successful in combating the confining and retarding influences of civilization and survives to-day in a fairly healthy and vigorous condition. I wish that I felt equally as sure regarding woman, but I feel that her ill-regulated life, if not remedied soon, will lead to a very marked degeneration, and through

this degeneration of woman will be brought about the degeneration of the race.

Decay of Parental Supervision.—One of the saddest features that we are witnessing to-day is the apparent gradual decay of the parental interest, for the presence of children in the household is the strongest factor in maintaining the happiness and integrity of the home, and in the development of the home life, so vital to the advance of the race. To-day, in spite of all the thought and care devoted to children, and there has probably never been an era in the history of the world when such intense interest has been aroused, the actual number of men and women who become parents is rapidly decreasing, while the average number of children to each union has fallen below the minimum of previous generations.

Decrease in Marriages.—There has been a very marked decrease in the number of marriages, accompanied by a great increase in the number of divorces. In the United States the ratio of divorce to marriage is 1 to 185; in England, 1 to 11,000; while in Canada there is but one divorce to every 63,000 marriages. Dr. J. S. Billings has said, "It is probable that the most important factor in the change in the birth rate is the deliberate and voluntary avoidance or prevention of childbearing on the part of a steadily increasing number of married people." Englemann, as a result of extensive study of the subject, arrived at the conclusion that the percentage of childless marriages in the United States increased in the nineteenth century from two per cent to over twenty per cent. Just what it would be to-day is difficult of estimation, but there is little to lead one to believe but that it has steadily progressed.

Idealization of Motherhood.—A sufficient idealization of motherhood has not been held up before our girls, and woman is daily pictured in almost every rôle but that of mother. Dawson emphasizes this fact none too strongly when he says, "It is woman as academician—excelling in scholarship, taking degrees, traveling in Europe in pursuit of some specialty, and finally entering upon a professional career of some kind—that becomes the ideal of thousands of our brightest girls and young women in schools, colleges, and universities. It is woman in public life—as club woman, author, actress, social reformer, or political agitator—that bulks up most conspicuously in the public imagination as doing the things that are really worth while for the woman of the present age." He goes on to say further, "It is the detached woman, whom one sees everywhere, who is influ-

encing most profoundly the ideals of woman's character and function in the world. These detached women are the heroines of novels, the central figures on the stage, the subjects of all kinds of popular art. It is not the Madonna that we see on the covers of current literature, in the half-tones of magazines and newspapers, in the social columns of the daily press, or in the fashion plates. Street life, indeed and travel are interesting indices in this connection. Here the woman with the lines of maternity in face and form has well nigh disappeared, except in rural communities, and in those parts of our cities where the foreign population still keeps alive the interests and customs of naïve motherhood. Everywhere in the thronging thoroughfares of city life, about stations and on railroads and steamship lines, we see, not Madonnas, but all sorts of nondescript social corsairs, rushing hither and thither in modish dress that not infrequently symbolizes the sacrifice of that physical development and health, and intellectual and moral qualities which make women efficient mothers of a race of men."

Organized Birth Control.—This subsidence of parental desire should be met at every turn and strongly combated by more enlightened and intelligent propaganda. Our young must be brought up in an atmosphere where the refining and ennobling influence of the home life will later on make their education in sex matters more easy of accomplishment, thus leading to a naturally reverent attitude towards propagation.

Dr. Englemann says, "There is no question as to the baneful sentiment which is gradually developing among people that bearing children belongs to low life and is degrading, which now and then becomes evident in aspersions cast upon those with large families, implying that their life is vulgar and sensual."

The propaganda of the numerous Voluntary Parenthood Associations and Birth Control Societies is replete with such statements as "woman's inferior status as a brood animal for the masculine civilization of the world," "A dominated weakling in society controlled by men." These are tempting bait that hook many an unwary one of both sexes and appeal strongly to unwilling mothers who have felt the "inner urge" calling loudly for a "wider freedom" to develop "fully rounded lives." In full cry, close upon their heels, comes the usual assortment of long-haired men and short-haired women, eager to enroll under any banner on which the, to them, magic word *sex* is inscribed.

In novels, magazines, public addresses, and almost everywhere to-day where the human language is written or spoken, do we find

such sentiments voiced, and it is often openly asserted that motherhood is a confining and retarding state of slavery, "an impertinent interference with private rights."

It is devoutly to be hoped that this very apparent subsidence of interest in motherhood as an institution is only a transitory phase in our advancing civilization and that the desire for motherhood with a realizing sense of all that it means to the race will again assert itself. However praiseworthy may be the intensive scientific and philanthropic study of children, and I would not for a moment belittle the honest efforts of those working in this field, it is yet true that our declining birth rate is of paramount importance, for you must first catch the child before you can rear it.

If a couple do not wish to have children, then life at its very beginning is the result of an accident, and further development is only too often greatly handicapped by a surrounding haze of parental selfishness.

The Era of the Child.—One of the most encouraging movements of the present time is the scientific and eugenic interest that has been taken in children, and just as this century has been largely a woman's era, the next century bids fair to be one of the child.

Home Life.—The hope of the future, it would seem, lies in meeting the growing materialism of the city by the development of the home life in the country and suburban districts. The preservation of the nation will depend upon the great middle class, those who have risen above the confining and retarding environment of poverty, but have not acquired the idle, migratory habits of the rich. The ultimate result under our present social conditions rests with the woman. To her should be made the last appeal, so that whether we rise or fall the final responsibility may rest upon the proper shoulders.

It has been aptly said that "great nations are not destroyed but commit suicide," and when women realize fully this fact and are called upon to save the race, I feel certain that the call will not be in vain.

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CHAPTER II

ORIGIN OF LIFE

Harvey's aphorism, "Omne vivum ex ovo"—Weismann's theory of germ plasm—
Theories of preformation—Fission—The ovum—Microscopy of the germ cells—
Schulte's definition of the cell.

"OMNE VIVUM EX OVO"

Many years have passed, over three hundred in all, since Harvey
formulated this aphorism. His pioneer study in the field of ovulation,
carried out in the seventeenth century, led him to the conclusion that
all life comes from an egg; and with few exceptions, all experiments
and investigations since that time have but tended to prove the truth
of his original assertion. While the statement that "every living thing
comes from an egg" may not be strictly true, it can well be accepted
in the majority of cases.

Weismann's Theory of Germ Plasm.—Weismann in his
"Germ-Plasm" says: "Long before the mountains were brought forth,
or even the dry land appeared, and while the earth was still only a wide
waste of waters, there was formed within these waters the essence of
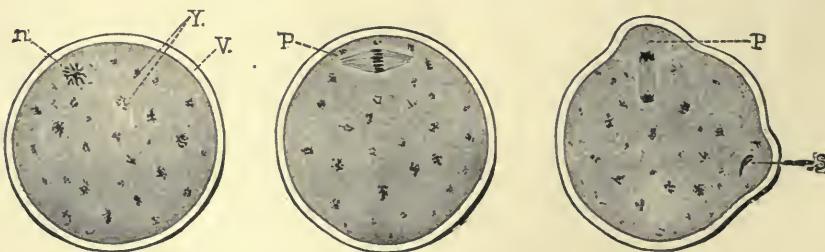
Fig. 1.—Formation of Polar Body (Sobotta) ×500. n., nucleus; v., vitelline mem-
brane; y., yolk granules; p., polar spindle; s., head of spermatozoon (Williams).

life enclosed within a minute cell. That life during all the hundred
million years since the Laurentian period has never died. Accident
may have eliminated many of its offshoots, but the essence of the life
remains."

16

Theories of Preformation.—The manner in which the child is formed in the mother's womb, how animals evolve from ova, and why the plant springs from the seed are all questions of absorbing interest, and they have occupied many thoughtful minds for thousands of years. But the whole question is so complex that it is not surprising to find it mixed in an almost hopeless tangle of fables and errors. Most of the older scientists who studied the subject were possessed with the idea that the complete individual, with all its parts, lay contained in the ovum, and that all further development was nothing more or less than a gradual unfolding of parts that were already infolded.

This preformation theory obtained general acceptance for many years, and as logical consequence there arose in the last century the further theory of Scatulation, which held the interest and attention of many thoughtful biologists of the period, and for some time it was believed that the outlines of the entire organism, with all its parts was present in the egg, and that the ovary of the embryo contained the ova of the following generation, these again, the ova of the next, and so on *ad infinitum.*

On this basis, the distinguished physiologist Haller calculated that God had created on the sixth day of His creatorial labors, 6000 years before, the germs of two hundred billion individuals and had ingeniously packed them all away in the ovaries of Mother Eve.
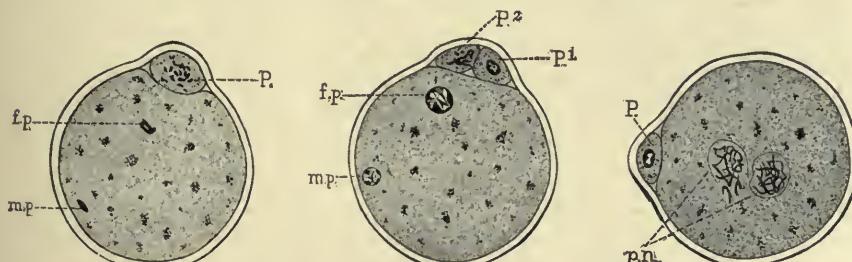
Fig. 2.—Formation of Female Pronucleus and its Fusion with Male Pronucleus (Sobotta) ×500. p., polar body; f.p. female and m.p., male pronucleus; p.n., pronuclei about to fuse (Williams).

Fission.—While it is true that we are unable to find in the life history of many of the protozoa, or one-celled animals, and also in quite a large number of the metazoa, or multi-cellular animals, any evidence of egg formation; still the majority of animals do arise from a single cell, or ovum. Those protozoa and metazoa that are exceptions to the general rule develop by fission, a division of the parent individual, or by buds, outgrowths from the parent stem.

The Ovum.—As a rule the female sex-cell, or ovum, is unable properly to develop and fulfill its destiny in nature unless fertilized by the male sex-cell. In order that fertilization may take place, it is necessary for the male sex-cell, or spermatozoön, to penetrate the female sex-cell. When such penetration occurs between the two sex-cells, fusion results, and the single cell resulting is known as a zyote. The metamorphosis that takes place in this single cell after fertilization is a marvelous change, and the further development from a minute and apparently simple cell into the development of a large complex organized individual is one of the most remarkable of Nature's many wonderful phenomena.

As has been stated, many of the older scientists were firm in their belief that a miniature of the mature individual was present in the ovum, and that further development consisted only in the growth and expansion of structures already preformed. It was but in the nature of things that this belief should not long continue after the publication of the researches made by Caspor Friedrich Wolff in 1759. He proved most conclusively that the adult structures developed gradually from what is apparently undifferentiated material. In other words, that the
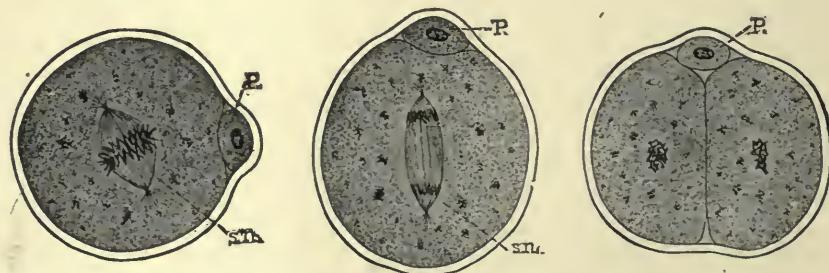
FIG. 3.—CHANGES IN THE SEGMENTED NUCLEUS (SOBOTTA) ×500. p., polar body., s.n., segmented nucleus (Williams).

development is epigenetic. But epigenesis, however ingenious in theory, does not altogether explain development by simply asserting that it occurs.

Following the theory of epigenesis, a new one was gradually evolved, that of predetermination. This theory for many years held the attention of investigators and played an important part in the conception of development.

Microscopy of the Germ Cell.—When we enter into a microscopic study of the germ cells, it is found that they possess a very definite amount of organization, and that the zyote contains within

itself certain structures contributed by the ovum, as well as certain other structures contributed by the spermatozoön. The human fertilized ovum is but a bundle of potentialities. Its further growth, while in its host, the mother, follows along certain very definite physiological lines.

As far as is known, living matter never arises, nor is it ever formed, except from preëxisting living matter. As the original structures of the zyote determine the characteristics of the individual that arises from it, it is probable that, to a certain extent, all development is predetermined. On the other hand, the fact must not be lost sight of that development is also epigenetic and that our modern conception should include certain factors of both theories.

The cell is the simplest particle of matter that is able to maintain itself and to reproduce others of its kind, and the simplest method of reproducing known is that of fission.

This is well exampled in the case of the small form of marine life known as the ameba. The ameba is a mass of protoplasm that feeds, grows, moves about, takes to itself oxygenated water and rids itself of waste material, demonstrating, in fact, all the essential phenomena of internal and external relationship. While it does not exhibit anything more than a general irritability, it yet answers to stimuli from without and presents us with quite a true counterpart of changes that occur in ourselves when we are acted upon by outside stimuli.
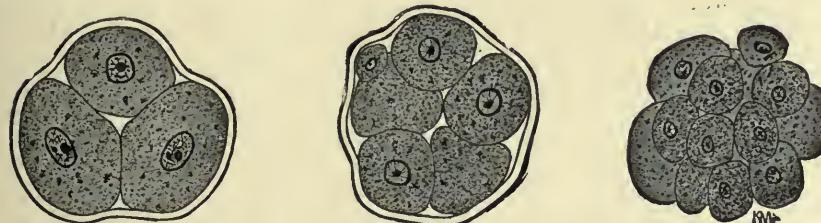
FIG. 4.—FORMATION OF MULBERRY MASS (SOBOTTA) ×500 (Williams).

The ameba performs all the actions that are essential to our idea of an individual existence, but it does more than this, it performs also the functions necessary for the continuance of the species to which it belongs. It reproduces itself in a way that gives us a readily understandable idea of the simplest method of reproduction. Its nucleus elongates, becomes constricted in its middle, and divides into two. While this division is being effected, the surrounding protoplasm divides into two masses, each of which accompanies one of the nuclei,

and as a result of this process, two individuals are formed where before there was only one. Each one differs from its original parent ameba only by its smaller size, and as the original ameba has altogether disappeared, being to all practical purposes, dead, we have in this simple method of reproduction the death of the parent contemporaneous with the appearance of the new generation.

Schultze's Definition of the Cell.—Max Schultze was the first to define the cell as a mass of protoplasm containing a nucleus. But his definition must be somewhat modified, as the existence of many cells without distinct nuclei has since been demonstrated. While some cells have no distinct nucleus, they yet have a certain amount of nuclear material in their composition. The definition of a cell, to be more exact, would be "A mass of protoplasm containing nuclear material." Cells vary greatly in size, all the way from $\frac{1}{25,000}$ to $\frac{1}{2500}$ of an inch in diameter, and many examples as large as several inches in length occur. The size of the cell depends largely upon the amount of nutritive substance which it contains. This nutritive material is present as food supply for the growing cell. The shapes of cells vary as well as the size, and while they are frequently spherical, the majority are not. The manner in which cells increase in number is by division, either direct or indirect.

In all forms of life, whether plant or animal, there are two dominant characteristics standing out clearly over all others. These are assimilation and reproduction. It matters little how widely separated in the process of evolution these may be, the same means are always used to accomplish the same ends. Sex is the great controlling influence, and the sexual, the most common method of reproduction in all forms of life, whether plant, animal, or man.

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CHAPTER III

DEVELOPMENT OF THE FEMALE CELL

The ovaries—The corpus luteum—Endocrine function of the corpus luteum—Dual function of the ovary—The so-called corpus luteum of pregnancy—Case report —Ovulation—Potential immortality of protozoa—Ovulation in its relation to fertilization.

The Ovaries.—The ovaries, two in number, lie laterally in the woman's pelvis, being connected with the posterior face of the broad ligament and with the uterus. Two functions are usually attributed to these glands; the one relates to reproduction and is intimately concerned with the development of the ova; the other has to do in some way with the general body function, thereby placing the ovary in the class of internal secretory organs. When the ovary is considered from this point of view, two widely different histological structures are to be distinguished—the corpus luteum and the interstitial cells.

The Corpus Luteum.—The corpus luteum was first recognized by Coiter as early as the sixteenth century, while the interstitial cells were not described until about the middle of the nineteenth century (1863), following the studies of Pflüger.

Endocrine Function of the Corpus Luteum.—Beginning with the work of Fränkel, multitudinous reports on the endocrine functions of the corpus luteum have been published, and the question of the functions of the interstitial tissues has been extensively worked up by Fränkel, Regard, Graves, Felner, and many others.

It may now be taken as an established fact that the ovary performs a dual function; namely, the liberation of the germ cell, and the formation of an internal secretion, so called, which remains in the body. The liberation of the germ cell is directly concerned with the perpetuation of the species, while the so-called internal secretion passes into the blood, by it is carried to distant parts of the body, and exerts a powerful effect upon the development and nervous control of the individual.

Though not necessary to the life of the woman, the ovary is, in many respects, one of the most important organs in her whole body,

and its sexual value should not be underestimated. Chipman says: "Not only is it the primary organ concerned in the reproductive cycle, but it also regulates and controls the complete attainment of develop-
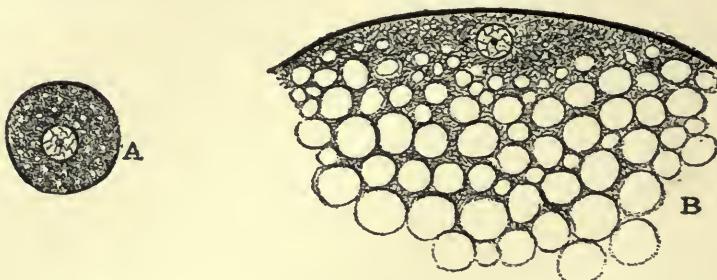
FIG. 5.—DIAGRAM OF A HOLOBLASTIC OVUM (*A*) AND A MEROBLASTIC OVUM (*B*). The yolk or food material is represented in both by clear globules (Quain).

ment, growth, and function in the individual herself. It so perfects its own generation, while at the same time it prepares for the next. Supreme individuality is only attained through its influence, and without it this attainment is never reached, and the individual remains
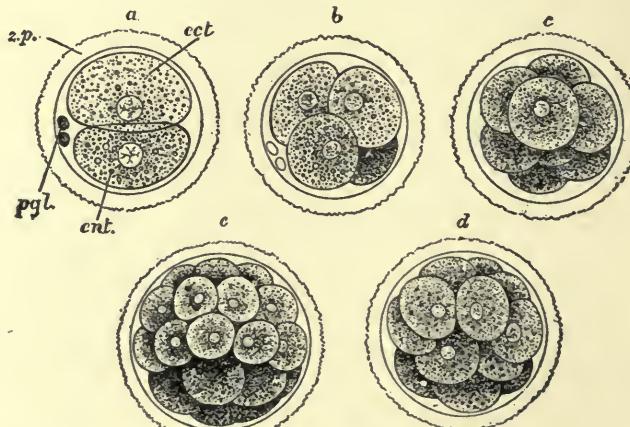
FIG. 6.—FIRST STAGES OF SEGMENTATION OF A MAMMALIAN OVUM; SEMI-DIAGRAMMATIC (Drawn by Allen Thomson after E. V. Benedin's description) (Quain). zp., zona pellucida; p.gl, polar globules; a, division into two segments; etc, larger and clearer segment; ent, smaller, more granular segment; b, stage of four segments; c, eight segments, the ectomeres partially enclosing the entomeres; d.c., succeeding stages of segmentation showing the more rapid division of the clearer segments and the inclosure of the darker segments by them.

imperfect and incomplete. Moreover, its continual presence is essential to the maintenance of this individual or sex perfection; and its removal or its disablement, even after maturity is reached, leads inevitably to descent or retrogression."

The ovary being a part of the very important system of internal secretory glands, its secretion or secretions react to a very marked degree upon the general metabolism of the body, exerting a particular action upon nutrition, growth, and function of the uterus.

I firmly believe with Fränkel, Edin, Lockyer, and others that the corpus luteum rather than the interstitial tissue is concerned with the rise and control of menstruation and that the so-called corpus luteum of pregnancy is but the persistence of a pathologically enlarged corpus luteum. The presence of a large, cystic corpus luteum is invariably associated with frequent and profuse menstruation which promptly returns to normal after the pathological growth is removed. This I have had opportunity to prove many times in operating on these cases. In support of this view I give the following case history of the most interesting and instructive example of this condition that I have ever met with:

Mrs. G. J., age twenty-seven. Menstruation regular since the age of fifteen. During her eight years of married life she had had three children and five miscarriages and one abdominal operation for the removal of diseased left adnexa. In 1911 I operated upon her for continuous right pelvic pain. At this time the right tube and ovary were found prolapsed and buried in dense velamentous adhesions. These were freed, the tube opened and the ovary sutured to the upper body of broad ligaments. The round ligaments were shortened and the appendix removed. Inspection of the left side showed a free broad ligament surface with no evidence of either tube or ovarian remains. Convalescence was uneventful. The patient remained well for about two years when she was taken suddenly with symptoms of acute intestinal obstructions. Prompt operation on December 20, 1913, disclosed the point of obstruction to be in a coil of the small intestine adherent between the right ovary and broad ligament. This ovary had become cystically enlarged since the previous operation and after being freed from the intestinal adhesions was removed entire with the tube. Following this operation the patient continued to bleed from the uterus regularly and at times profusely for the next year and a half, and was again operated upon in January, 1915, at the Woman's Hospital. At this time a thorough search was made for any ovarian tissues that might account for the regular menstruation which the patient had been having, and both broad ligaments were seen to be free and clear from any evidence of ovarian tissue. A subtotal removal of the uterus was then performed and during this operation a small cyst about one inch in diameter, having the appearance of a corpus luteum cyst, being lined with a thick layer of yellow lutein tissue, was removed from between the folds of the right broad ligament. This, with the uterine corpus, was submitted to the laboratory for examination and report. Convalescence was uneventful and the pathological report on the specimens was as follows:

Spec. Uterus. Ovarian tissue.

Diag. Adenomyometritis uteri—premenstrual change in the mucosa. Cystic corpus luteum.

Exam. MACROSCOPICAL:—Uterus with round ligaments.

Uterus measures about 5×5×3 cm. The myometrium is thickened, mucosa is

hyperplastic, especially in the fundus. The stump of the tube is rather hyperemic. In the lower portion of the corpus we notice a slight prominence in the mucosa. On section, a small cyst of about ½ cm. diameter, filled with bloody liquid is situated in the center of the myometrium.

The ovarian tissue consists of a slightly cystic corpus luteum of pregnancy. There is not much blood in the cavity, but mucus is present. The layer of granulosa cells is thick and well preserved. In most places the theca interna and externa surround the granulosa layer. There is also some hemorrhagic vascular fibrous tissue present at one area which has no special characteristics typical for the ovary. This stroma is scant and contains no follicles. The sections, therefore, consist almost wholly of corpus luteum constituents with only a minute amount of ovarian stroma at one point.

OVULATION

Under ovulation is included the growth, development, and ultimate rupture of the graafian follicles. The direct causative factor in bringing about this rupture, which results in the discharge of the ovum, is still more or less of an open question. During the life of the ovary immature follicles are found at or near the center of the ovary, which, as they mature, grow in size and leave the central zone, approaching the periphery of the ovary. When the periphery is reached, the follicle pushes it outward, producing a very pronounced bulging at this point. The ovarian stroma is pushed aside, and the tunica albuginea, with the overlying epithelium and blood capillaries, become much thinned as a result of this compression.

It is generally supposed that this pressure so interferes with the nourishment of the ovarian stroma as to result in a pressure atrophy, and that this atrophy so reduces the resistance of the tissue that it is finally overcome and the distended follicle then bursts, discharging its contents into the peritoneal cavity: It is quite possible, as the experiments of Schocker would seem to indicate, that ovulation is due to a specific enzyme.

Protozoal Immortality.—Weismann believed that protozoa are potentially immortal as germ cells. Maupas demonstrated the fact that there were various kinds of infusoria that did not propagate definitely by fission, but that a sexual influence was at times necessary. Calkin has shown that regular periods of depression arise, and that while a spontaneous regeneration from the effects of such depressions might take place, artificial stimulation can be made to aid greatly the animals in overcoming critical periods. In many instances, the depression periods proved fatal unless there was such a sexual stimulation.

Woodruff, by selecting conditions of environment closely simulating those of nature, was able to keep alive almost indefinitely without any sexual stimulation whatever a certain strain of paramæcium. This would lend belief to the truth of the theory of the potential immortality of the protozoa of Weismann.

OVULATION AND FERTILIZATION

It is most probable also that ovulation corresponds more or less closely with fertilization and occurs at intervals throughout the month, perhaps not even excepting the latter days of the actual period of the menstrual discharge. A further inference is perhaps justifiable that ovulation and menstruation may, but do not necessarily coincide. This is supported by the researches of Bland-Sutton and Heape on menstruation of monkeys and baboons, who have shown that in these animals menstruation and ovulation do not necessarily take place at the same time. Furthermore, it is strengthened by the observations made by gynecological surgeons in the course of operations: viz., that apparently ripe, or recently ruptured graafian follicles are found in the ovary at various times of the intermenstrual period, while on the other hand, there is frequently no trace of either ripe or recently ruptured follicles found immediately after the menstrual period.

It is now generally admitted that the menstrual cycle in woman and in the female monkeys is homologous with the estrus cycle of the lower mammals. The estrus cycle is divided by Heape into proestrum, estrus and diestrum. During proestrum the generative organs of the female show signs of special activity, such as swelling of the vulva, with a coloration or flushing of its surroundings, and a discharge of blood or mucus from the vagina. This is immediately followed by the "estrus," or "period of desire," during which only is the female capable of impregnation and will receive the male. If pregnancy does not occur the estrus, after a brief space in which desire subsides, is succeeded by a period of quiescence, or diestrum, which lasts until proestrum again sets in. Menstruation in the human female is homologous with the proestrum. Though there is no fixed "period of desire," there is still an indication that a vestige of this persists, as denoted by the fact that a phase of more pronounced estrum commonly succeeds the cessation of menstruation. It is quite clear from the results of comparative methods that the significance of menstruation

does not lie in the mere periodic growth and subsequent destruction of the mucous membrane, but in the cycle as a whole. The essence of the process is not the preparation of a menstrual decidua, but the formation of a new endometrium.

In the case of most lower mammals, the generative organs lie dormant through a large part of the year, and when the breeding season approaches, the endometrium undergoes, in the proestrum, a species of regeneration resulting in the development of a new surface on which the ovum may implant itself. In the human female there is no longer this regular breeding period, but desire and the possibility of impregnation occur at irregular periods all the year round. In the
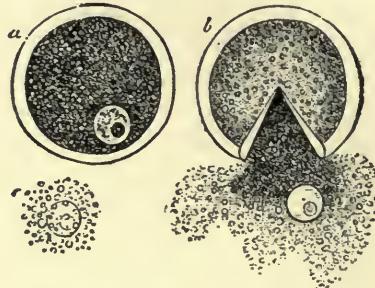
Fig. 7.—Ovarian Ovum of a Mammifer (Allen Thomson). a., the entire ovum, viewed under pressure; the granular cells have been removed within; b., the external evat or zona burst by increased pressure, the yolk protoplasm and the germinal vesicle having escaped from within; c., germinal vesicle freed from the yolk substance.

human subject the monthly regeneration and preparation of the endometrium are for the same purpose.

In the lower mammals ovulation takes place during estrus or in pro-estrum, and in most animals fertilization of the ova occurs at this time. It is quite possible that as there is no fixed period corresponding to "heat" in the human subject a considerable delay may occur between insemination and ovulation on the one hand, and between insemination and fertilization, or the actual union of the male and female elements, on the other hand. But it seems reasonable to suppose that the most favorable condition for successful impregnation lies in the simultaneous occurrence of insemination and ovulation, or at least at no great length of time from it, and the fertilization occurs immediately on the meeting of the two elements, just as is the case in the lower animals. In conjunction with each ovary there is an oviduct, the fallopian tube, opening into the uterine cavity at one end and into the peritoneal cavity in the immediate vicinity of the ovary at the other.

At the distal end, encircling its opening, is a fringe-like process—the fimbriæ. These fimbriæ, when expanded, are supposed to aid in directing the ovum into the tube. The tubes are about four inches in length and continuous with the superior portion of the uterine cavity. The tubes are covered by a serous coat, reflected from the peritoneum lining the abdominal cavity, are composed of muscular fibers and are lined with ciliated epithelial cells. In many of the lower mammals a single uterus is wanting, but is represented by two expanded tubes which take its place.

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CHAPTER IV

METHODS OF REPRODUCTION

Protozoal methods of reproduction—Formation of the zyote—Morphological and physiological differences between the ova and spermatozoa—Mitototic cell division—Early ideas of fertilization—The span of life of a spermatozoön—Definite sexual attraction—Union between germ cells.

When the ovum has been expelled by the rupture of the graafian follicle, it is received on, or into, the fimbriated end of the fallopian tube. The fimbriæ are covered by a layer of ciliated epithelium continuous with the ciliated epithelium lining the tube, and the action of the cilia wafts the ovum into and along the tube in the direction of the uterine cavity. At any point in its passage along the tube where it meets the spermatozoa, fertilization may occur. It is possible for the fertilization to take place in the ovary if the ovum is not expelled when the follicle ruptures, or on the fimbriated end of the tube, or even in the cavity of the uterus, but as a rule it happens in the tube.

Fertilization may occur at any time during the intermenstrual interval, and imbedding take place, either in the period of quiescence, or in the period during which, without the occurrence of pregnancy, the premenstrual and menstrual changes would have been progressing.

The result of our seriation of these early cases is not consistent with the older views regarding menstruation and its relations to imbedding, for it carries with it the conclusions that the menstrual decidua is not a preparation for the reception of an ovum; that menstruation is not an abortion of an unfertilized ovum; and that ovulation does not necessarily coincide with menstruation.

Protozoal Reproductivity.—The method of reproduction which results in the formation of new individuals is by division. This is most frequently preceded by a conjugation in the protozoa, or by fertilization in both protozoa and metazoa. In the protozoa there are three principal methods of reproduction:

1. The division of the individual takes place, resulting in the formation of two parts exactly similar in size and structure, but smaller

in size than the original parent body.   These, however, eventually enlarge to form cells of corresponding size to the parent cell.

2. A small outgrowth, or, as it is frequently called, the bud, develops on the parent cell, from which it eventually separates.

3. Many daughter nuclei arise from the division of the nucleus in the parent cell.   The metazoa reproduce their kind either sexually or asexually.   When asexual reproduction occurs, the process takes place without the aid of sex cells, as is instanced by many polyps, sponges, and flat worms.   Where the reproduction is sexual, it is necessary that the individual develop from a mature ovum.   In nearly every instance the ovum has to be fertilized by conjugation with a spermatozoön.

Formation of the Zyote.—When the zyote is formed, the ova of quite a large number of animals develop without this fertilization. The size of an animal is determined by the kind of sex cell it produces, that is to say, the ova by the female and the spermatozoa by the male. But in quite a large number of species is found but a single sort of individual which produces both ova and spermatozoa.   These are the so-called hermaphroditic forms.

Morphological and Physiological Differences.—There is a wide morphological and physiological difference between ova and spermatozoa.   As a rule, ova are oval in shape and vary greatly in size.   In the mouse they are only about 0.065 mm. in diameter, running all the way from this up to a maximum of several inches in length, as
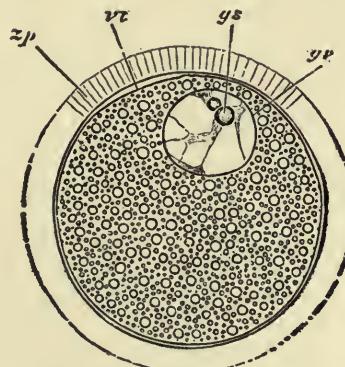
FIG. 8.—OVUM OF THE CAT; HIGHLY MAGNIFIED.   SEMI-DIAGRAMMATIC (QUAIN).   zp., zona pellucida, showing radiated structure; vi, vitellus, round which a delicate membrane is seen; gv., germinal vesicle, gs, germinal spot.

found in some birds.   In the early study of the ova it was supposed that the ovum as a whole took part in the development of the individual, but later the nucleus was identified as the true germinal vesicle.

In the study of the male sex cells, or spermatozoa, is found a very different formation. These are composed of a head, a middle piece, and a vibratile tail. They are usually of the flagellate type. Spermatozoa are minute in size, varying from something less than 0.02 mm. to 2.0 mm. According to Wilson, it would take from 400,000 to 500,000 sea urchin spermatozoa to equal in volume the ovum of the same species. Thus it is not surprising that the number of spermatozoa produced by a single male may be many hundred thousand times as great as the number of eggs produced by the female. With few exceptions the eggs lack the power of locomotion. The spermatozoa, on the other hand, are active motile organisms, propelling themselves by the flagellate action of their tails hither and thither in their search for the passive ova which they are to fertilize. As a rule, only one spermatozoön is necessary for the act of fertilization, so that but very few fulfill their destiny. The enormous horde of these is in all probability not a waste on the part of nature, but is to make more certain the fertilization of the ova.

In nearly all species, fertilization must take place before the ova can develop, and by fertilization we understand the fusion that takes place between an ovum and a spermatozoön with the re-arrangement of the contents of the fertilized cell that results.

As has been stated, it is common for only one spermatozoön to enter the ovum, but there are a few examples found among certain insects, birds, and reptiles, where more than one spermatozoön enters and fuses with the ova. In some instances the entire corpus of the spermatozoön, the head, the middle piece, and tail, may become completely imbedded within the ovum. The tail is, as a rule, left outside, and in certain few cases the head alone enters the substance of the ovum.

Mitotic Cell Division.—Wilson in "The Cell in Development and Inheritance" says: "In mitotic cell division we have become acquainted with the means by which, in all higher forms at least, not only the continuity of life, but also the maintenance of species, is effected; for through this beautiful mechanism, the cell hands on to its descendants an exact duplicate idioplasm by which its own organism is determined. Fertilization, or fecundation, is the essence of sexual reproduction, and in it we behold a process by which, on the one hand, the energy of the cell division is restored, and by which, on the other hand, two independent lines of descent are blended into one."

Early Ideas of Fertilization.—Fertilization was regarded by many of the early embryologists as a certain kind of stimulus contributed by the spermatozoa, and by means of which the ovum was animated and rendered capable of development. This subject is one of fascinating interest, but to enter into a detailed consideration of the innumerable ways in which germ cells are brought together would carry us into byways leading far afield from the intended scope of this work. It should be borne in mind that according to the species the conjugation between the cells may take place, either inside or outside the body of the mother. When the union is accomplished outside the mother, both spermatozoa and eggs are discharged into a common medium in which fertilization and further development of the cells take place.
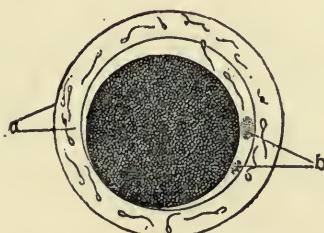
FIG. 9.—OVUM OF RABBIT FROM THE FALLOPIAN TUBE, TWELVE HOURS AFTER IMPREGNATION. (BIRCHOFF.) Over the zona a, spermatozoa are seen, and others in the perioitellim space; b, polar globules.

Spermatozoal Life.—The span of life of a spermatozoön is difficult to determine, but it is known that they may exist for a very long period of time without losing their fertility. Their active motile life begins with their discharge, and is comparatively short. Many examples are found where the spermatozoa are inert when first discharged and do not become motile until after entering into contact with the medium in which they are deposited.

Sexual Attraction.—The question of a definite sexual attraction between germ cells is one of absorbing interest, and in some cases a very positive attraction is seen to exist. If the spermatozoa and ova of one of these species be mixed together and succeeding events carefully watched, it will be seen that in a short time each ovum is surrounded by enveloping spermatozoa, which cling to its periphery by their heads, and by the violent flagellate movement of their tails actually produce changes in the position of the ovum.

While the exact nature of this attraction is not known, it would seem, according to the investigations of Pfeffer carried out on the

spermatozoids of plants, to be of a chemical nature, and experiments conducted in accordance with this theory point strongly to a specific chemical substance as being the basis of attraction between germ cells of the same species. It seems to be quite clear that it is not the nucleus of the ovum alone that exerts the attractive force, but that a large part is played by the cytoplasm of the ovum, for the Hertwigs and others have demonstrated the fact that spermatozoa will quite readily enter a fragment of the ovum which does not contain any nucleus whatsoever.

Union of Cells.—After the union between the germ cells has taken place, many wonderful changes occur in both. Almost as soon as penetration is accomplished, the movements of the tail cease. Occasionally it may actually enter with the rest of the organism, but in most instances, it is left behind and remains inert on the outside. Even when it enters the ovum, it promptly degenerates and plays no part in the process of fertilization.

The effect produced on the ovum by the entrance of the spermatozoön is most startling. In every part of its being, marvelous changes may be observed to take place. The vitelline membrane, by the very rapidity of its formation, shows that the stimulus derived by fertilization spreads with the greatest rapidity throughout the entire ovum. The ovum may now even show marked ameboid movements, contracting and changing its form in many different ways. A new life has come into its beginning and is now well under way.

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CHAPTER V

GROWTH OF THE FERTILIZED CELL

The imbedding of the human ovum—Survival of the fittest—Seasonal influence and breeding—Menstruation and periodicity.

IMBEDDING OF THE OVUM

The study of the process by which the imbedding of the human ovum is accomplished is one of captivating interest. It has been so well described by Bryce and Teacher that I cannot do better than give *in extenso* their unsurpassed description of this marvel of nature.

"The ovum having attained the stage of an early blastocyst, measuring about 2 mm. in diameter (i.e., approximately the size of the
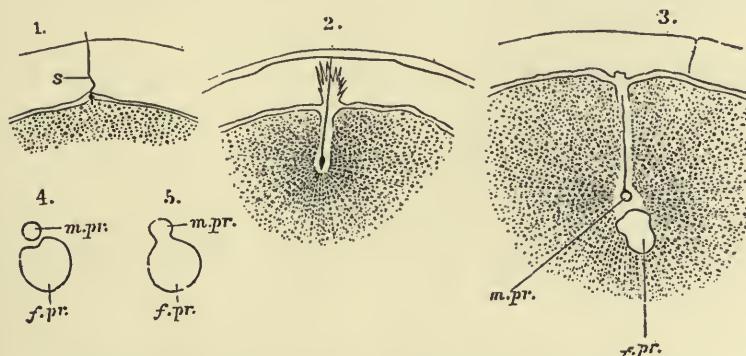
FIG. 10.—FERTILIZATION OF THE OVUM OF AN ECHINODERM (SELENKA). s., spermatozoon; m.pr. male pronucleus; f.pr., female pronucleus. 1. accession of a spermatozoon to the periphery of the vitellus; 2. Its penetration and the radial disposition of the vitelline granules; 3. Transformation of the head of the spermatozoon into the male pronucleus; 4, 5. Blending of the male and female pronuclei.

mature blastocyst), comes to rest in a slight depression; but neither a crypt nor a fissure in the endometrium destroys the surface epithelium, and, continuing its destructive activity, passes into a space in the decidua which has been thus produced. Necrosis followed by solution (digestion) of a considerable mass of the endometrium follows,

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resulting in a formation of an implantation cavity. Changes leading to the production of decidua begin immediately after the solution of the epithelium, and the elevation is formed which is the characteristic resting place of all the four earliest ova at present known.

"The mouth of the implantation chamber is probably blocked by a mass of blood clot, the cavity having meantime been filled by blood shed from the opened-up maternal capillaries.

"The ovum, now rapidly differentiating, develops a thick tropho-blast all around the blastocyst. The ovum is at first free in the implantation cavity. The trophoblast from a very early stage shows a cellular layer and a plasmodial layer. The plasmodium throws out buds which stretch towards the walls of the decidual chamber and it is continually being added to by active proliferation in the cellular layer.

"In the first place, the plasmodial masses exert mainly a destructive action; this results in the production of a relatively larger implantation cavity. The destruction of the decidua is necessarily associated with the destruction of vessel walls and the opening up of glands. Hemorrhage occurs with the cavity, but the blood does not coagulate. It serves to nourish the ovum, and after a time it begins to circulate among the trophoblastic processes. Up to this stage the ovum has not become attached to the decidua. It now becomes fixed, first by anchoring strands of plasmodium and later by development of primitive cellular villi. In the further changes the greater part of the early plasmodium disappears after being spun out into fine threads, while the marginal cells of the cytotrophoblastic columns continue to form new plasmodium. On the other hand, the plasmodium may in part persist, the strands arranging themselves over the cytoblast columns as an endotheliumlike layer, while the outlying parts remain as the irregular masses invading the decidua. It appears probable that the extensive plasmodium is in great part a temporary formation provided for the early enlargement of the implantation cavity. The attachment of the ovum is effected when the columns of cytotrophoblast reach the decidua at points from which the necrotic layer has been removed, and become fixed by the terminal cells insinuating themselves among the elements of the decidua."

As Wilson says: "We thus find the essential fact of fertilization and sexual reproduction to be a union of equivalent nuclei, and to this all other processes are tributary. From the mother comes, in the main, the cytoplasm of the embryonic body which is the principal stratum of growth and differentiation. From both parents comes the hereditary

basis or chromatin by which these processes are controlled, and from which they receive the specific stamp of the race."

Man, in common with all other animals, inherits his personal characteristics both bodily and mental from his parents, and the acquisition of these dates back to the original fusion between the two parent cells, the ovum and the spermatozoön.

After the development of the embryo to maturity and its final expulsion from the uterus, it begins what may be designated as its individual existence.   Certain fixed laws govern its further activity, dependent upon three great causes: heredity, training, and environ-

FIG. 11.—HUMAN SPERMATOZOA (WILLIAMS).   h., head; c., intermediate portion; t., tail.

ment.   During the rest of life, while environment and training may and at times, do exert a very strong influence, heredity is always the most potential and all-powerful determining factor in the conduct of the individual.

In the great struggle for existence, various factors make for the survival of the fitter.   Physical strength is a most important factor; some survive solely because they are strong, while others owe their survival to cleverness; some are agile above their fellows, and in this way escape the dangers that lead to extermination; while still others survive because they are able to put on a garment of invisibility that hides them from their enemies.

Punnett has made some very interesting calculations in this regard. He has estimated that if in a population of ten thousand wild animals, there were only ten of a new and promising species, and that these had only a five per cent selective advantage over the original forms, they would predominate in less than one hundred generations and the

older variety would almost completely disappear. There are many instances known of such replacements occurring in primitive nature, and it is quite evident that the rate of replacement of the old by the new would depend in great part on the fertility of the new. It has many times been observed that an intense elimination of individuals, unaccompanied by life-saving peculiarities or variations, will move a species in a certain direction which is known as lethal selection, but it is likewise plain that variants that possess some valuable life-saving quality will predominate with greater rapidity if they are at the same time more prolific than their neighbors, and such instances are known as reproductive selection.

If only a casual review of plant and animal life be made, we are at once impressed with the fact that they are extraordinarily fertile and it would appear oftentimes extravagantly so. It has been estimated that if all the progeny of but one oyster survived and multiplied "its great, great, great, grand offspring would number sixty-six with thirty-three noughts after it and the heap of shells would be eight times the size of our earth."

When a family reaches into the thousands or millions, there is a wide margin to allow for accidents, so that careful nursing is of minor importance; and in the lower forms of life, where parent rearing of such offspring is impossible, the spawning method has obvious advantages. From the point of view of the parent advantage, there are manifest disadvantages inherent in this method. Multitudinous production often causes the exhaustion and even the death of the mother, as is instanced not only in the delicate butterfly, but in the strong marine lamprey, where she dies in the process of reproduction.

There is an old-world type, the peripatus, that, although having no armor nor weapons for offense or defense, has held its own in many parts of the world for millions of years. It has been able to do this because of its nocturnal and elusive habits, and because its young are carried by the mother for a long time before birth, and when finally born appear as miniature adults, ready at once to provide for themselves.

Almost all animals, with the exception of man, have a regular breeding season which is devoted to the propagation of their species. This period of sexual activity is to a considerable extent modified by climatic conditions and environment, any marked change in the life habits of an animal, as Darwin has shown, tends to affect its powers of reproduction, and many animals breed poorly, or not at all, in cap-

tivity. The term sexual season is used to designate the period, or periods, when the sex organs show a special characteristic activity, and the individual is capable of copulation. In many species the male is not limited in this respect, being able to serve at any time, while the female is restricted to definite periods of reception. When, as a result of the coming together of the sexes, impregnation occurs, it is followed by a period of gestation, varying in length according to the species. This in turn is followed by delivery, then comes a short period of recovery, the puerperium, and a longer period of nursing or lactation.

Seasonal Influence and Breeding.—While in the lower animals the sexual season is usually limited, and occurs rhythmically, this rule does not hold as the scale of life ascends. There is a marked similarity between the sexual season in the lower animals and the period of menstruation in the higher mammalia. The female monkey, as well as the human female, has a continuous series of diestrous cycles at monthly intervals, but is not capable of impregnation at every one. Unlike the majority of mammals, monkeys occasionally copulate at other times than the regular breeding season.

Periodicity of Menstruation.—In the human female, from puberty to the climacteric, menstruation recurs monthly at intervals of from twenty-eight to thirty days. Numerous exceptions to this rule occur, and there may be long intervals between the periods, or menstruation may come as often as every two weeks. Climatic conditions exert a very marked influence on menstruation, it being more frequent and regular in warm climates than in cold, while its regularity is often disturbed by changes of environment, such as change of residence and foreign travel when a temporary cessation for several months is often observed.

While it would seem from the evidence thus far gathered that primitive woman, in common with the lower primates, may have a definite sexual season, it is doubtful if civilized woman is subject to any such restrictions.

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CHAPTER VI

DEFINITION AND CLASSIFICATION

Definition of fertility—Race and fertility—Duration of Fertility—Definition of Sterility—Sterility classified—Case report on sterility—Predisposing factors of sterility.

FERTILITY

The fertility of a people depends to a greater or less degree upon many outside influences, the more common of which have been considered in a previous chapter. The duration of woman's reproductive period, while it begins earlier than that of man's, is not as prolonged and has a definite ending—the climacteric. With man there is no definite ending, and he often retains his fertility to an advanced age. Woman's fertile period starts at puberty and gradually increases up to about the age of thirty, after this it begins to decline. Her age of greatest fertility is between twenty and thirty.

Race and Fertility.—It is undoubtedly true that fertility is to a great extent a racial characteristic, capable of hereditary transmission, and it has been clearly shown that woman may inherit a high degree of fertility from either the paternal or maternal side of her family. When once the rate of fertility has begun to decline, it is rarely if ever raised in succeeding generations.

Definition of Sterility.—When we endeavor to find a satisfactory definition for sterility, we are met at the outset with the fact that the word sterility admits of various interpretations and must be used in quite a broad sense. While it is true that in the ordinary acceptance of the term, sterility implies a condition in which the woman does not conceive, or if conception occurs, is unable to bear a viable and living child, there is a very wide difference between incapability of conception and incapability of reproduction. If a woman cannot reproduce her kind, the fact that she may be able to conceive is of minor importance.

Classification of Sterility.—We thus see at once the necessity

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for establishing different classes of sterility before a systematic consideration of the subject can be undertaken. While it may be helpful for the purpose of clinical study to divide all cases of sterility into two classes, absolute sterility and relative sterility, these become at times more or less arbitrary and are not always entirely satisfactory. Generally speaking, we include in the class of absolute sterility those cases where conception has never occurred; while in the relative class are placed those where conception has taken place but has resulted in the early death of the fetus, or in the birth of a non-viable child.

To these divisions into absolute and relative sterility, a third subdivision of conditional sterility may be added. This is distinctly an acquired condition. The woman may have given birth to one or more living children at normal intervals and then follows a protracted period of sterility. The following detailed definitions of sterility are probably as satisfactory as any that can be formulated:

Primary Sterility denotes that a woman, while living with a fertile man in her period of sexual maturity, has yet never been pregnant.

Secondary sterility indicates those cases where the woman has borne one or more children and becomes sterile thereafter.

Congenital sterility includes those women who, from the very beginning of their sexual life have had some condition responsible for the sterility.

Acquired sterility implies that the woman was originally potentially fertile but later contracted some condition that caused her to become sterile. This division includes both primary and secondary sterility.

Apparent sterility, also called **functional sterility** and **potential sterility.** In this group are placed those women who, owing to some prohibiting condition of their married life, have never had a proper chance to become pregnant.

Absolute sterility exists where the uterus, tubes, or ovaries are absent; when the tubes are occluded, preventing the passage of the spermatozoa or entrance of the ovum; when the ovaries are so surrounded by adhesions as to prevent the ovum from gaining access to the tube or have their cortex so thickened as to prevent the liberation of the ovum. Cases coming under this head may be primary, congenital, or acquired.

Under sex incompatibility will have to be included all cases that do not properly come under any of the above headings.

In many unions coming under the head of absolute sterility, the fault lies with the male, the rate being variously estimated at from twenty to fifty per cent. However, the question of the male does not concern us here save to emphasize the fact that his fertility should never be taken for granted. Only too often is the wife unjustly blamed for what is not in the least her fault, no examination of the husband ever having been made to determine the question of his fertility. The great number of women that have been thus accused of sterility and even subjected to unnecessary operation is a sad chapter in gynecology. So typical of this was the following case that I give the history in detail.

Mrs. F. A. was twenty-nine years old and had never suffered any serious illness or injury; her menstruation had always been regular and normal in every way, but though married for seven and one-half years, she had never been pregnant. Frequent examinations had been made by leading physicians in her native city and an exploratory laparatomy decided upon to determine and, if possible, correct the cause of her sterility. When she was referred to me for this operation, an examination made after intercourse failed to show the presence of any spermatozoa whatsoever in her genital tract, and a subsequent interview with her husband, who said he had never been examined as to his fertility, disclosed the fact that only one testicle had descended into his scrotum and that this had been removed for a chronic inflammation some years before marriage. His fertility had been taken for granted on the totally inadequate testimony that he was able to cohabit regularly.

As I have already said, it is not my intention to take up in detail in this book the question of male sterility. This subject I leave to those far better qualified. Their studies have led to a somewhat wide divergence of opinion regarding the proportionate responsibility of the man in childless marriages and tend to show that it varies considerably in different social states.

Predisposing Factors in Sterility.—For instance it is greater where conditions predispose toward impure intercourse, sexual excess, self-abuse, and late marriage, as exist among the well-to-do, than it is among those who marry early and lead an active, healthy, busy life devoted to hard physical work. There are various ways in which the man may be at fault. The testicles may contain no live spermatozoa, or if live spermatozoa be present, pathological changes in the epididymis may prevent them reaching the seminal vesicles. In these cases, the semen is composed of prostatic secretion alone and is devoid of spermatozoa (azoösperma). In other cases, the semen may be normal, but the man, because of some malformation of the penis,

stricture of the urethra, or inability to obtain erection, cannot deposit it in the vagina (Impotence).

From now on in this work I shall take for granted that the fertility of the husband has been demonstrated beyond all reasonable doubt, and that the wife has had a proper chance of becoming pregnant.

CHAPTER VII

Pathological conditions influencing sterility—Germ cell retardation and racial poisons—Primitive woman's freedom from sterility—Etiology of sterility—Anatomical errors and maldevelopment — Vaginismus — Dyspareunia — Case report of infantile organs—Suspension of ovarian activity—Menstrual cessation through shock, obesity, climatic changes, over indulgence in sexual intercourse, and X-ray exposure—Acquired sterility, absolute or relative—Germ cell injury through parental alcoholism—Social factors and reproductivity—Frequent child bearing and reproductivity—Incompatibility as a factor in sterility.

Pathological Conditions Influencing Sterility.—There are many pathological conditions that may be responsible for a sterile union. In the case of the man, sterility may be due to an inability to perform the sexual act, or to an actual absence of semen or fertile spermatozoa. The former may be the result of want of sexual desire, absence of the power of erection and ejaculation, or the cause may be anatomical, pathological, physiological, or even psychological. Absolute sterility may be due to the absence of fertile spermatozoa and can be either congenital or acquired. Congenital male sterility occurs when the testicles are so imperfectly developed that they do not supply fertile spermatozoa. Again, sterility may be caused by various diseases of the generative organs, and also from constant exposure to the X-rays.

Germ Cell Retardation.—The germ cells during their development in the female sex glands are markedly affected by racial poisons such as alcohol and by the venereal disease syphilis. After fertilization, the ovum in the uterus may be attacked by syphilis, or its future life interrupted by abortion. When the fetus has reached a viable age, prenatal conditions, racial poisons, and abortion are frequent causes of death.

Primitive Woman's Freedom from Sterility.—Among primitive people, woman is notoriously free from many of the steriliz-

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ing influences to which her sister in our present-day civilization, is prone. Departing from a natural and adopting an unnatural and artificial mode of life, we find that Nature exacts due penalties for every transgression of her laws. The female among savage tribes has every advantage and opportunity to develop physical perfection, and her strength and endurance suffer little by comparison with the male. How different in our modern system of society!

Etiology of Sterility.—In considering the various and varied causes of sterility I shall attempt no systematic classification, or even enumeration of all the possible causes, for I feel that such would lead to much repetition and little profit. While a pathological classification is interesting, and at times necessary, a broader clinical arrangement is more valuable for study, and more in keeping with a monograph of this character.

Anatomical Errors and Maldevelopment.—From an anatomical standpoint, errors in development and lack of development of the genital passages and organs may play an important part in sterility. Such maldevelopment may actually prohibit intercourse, as in absence of the vagina; or prevent conception, as when the uterus, ovaries, or tubes are missing. Absence of the vagina is rare and when present is always associated with an undeveloped condition of the uterus and ovaries, and such cases offer no hope of a cure from the viewpoint of sterility. Atresia of the vagina is a more common condition and occurs when the fusion of the ducts of Müller fails to reach the surface. The existing barrier is an obstructing membrane that lies just above the hymen and this can be easily divided, thus establishing the patency of the vagina. Occasionally cases are met where the vagina is congenitally too narrow to admit of intercourse (stenosis) or so constricted in its middle third (hour-glass contraction) as to render proper intercourse difficult. An abnormally rigid hymen may for a while prevent intercourse, but its resistance is usually eventually overcome and it does not often require cutting.

Coitus may be rendered impossible by nervous spasm of the muscles at the vaginal orifice and of the leg muscles (vaginismus), which is excited by the slightest approach on the part of the male, or it may be rendered so extremely painful by some lesion of the genital passage or genital organs that after one attempt it is very seldom repeated (dyspareunia). On the other hand, there may be various

errors in development of the genital tract that, while they do not offer any obstacle to proper intercourse, yet are a cause of sterility. Such are absence of the uterus, fallopian tubes, or ovaries. At times even though not actually absent, these organs may be so underdeveloped or maldeveloped as to be incompatible with conception. The so-called infantile pelvic organs are associated with a very high degree of sterility, but they may later mature and the woman give birth to one or more children.

Mrs. S. M., twenty-six years old, had been married for three years. She had had scarlet fever at six years of age and measles twice, at twelve and sixteen years respectively. She was a premature and only child of her mother and weighed but one and one-fourth pounds at birth and was never particularly well or robust as a child. Menstruation began at thirteen years; was regular, lasting seven to nine days; moderate in amount. She suffered always from severe dysmenorrhea, backache, nausea, and vomiting. For the past five years the dysmenorrhea has become at times unbearable and she has had two attacks of menstrual mania. Two years after marriage, the uterus was dilated and curetted, which slightly relieved the menstrual pain for about one year. The dysmenorrhea then became as severe as ever. Examination: Patient short of stature. External genitalia undeveloped, pubic hair deficient, vagina small and short, cervix infantile in type, its vaginal aspect only one-half inch in diameter. Fundus likewise infantile type, being about the size of an English walnut. The combined depth of the cervical canal and uterine cavity measured but two inches. In this case an unfavorable prognosis was given and no operative treatment advised. Subsequent to this examination she menstruated normally for one year without the slightest pain, conceived during the following year and gave birth by normal delivery to a living child at term. Two children were born after this without any return of her old menstrual difficulty.

FIG. 12.—INFAN-
TILE UTERUS
(Schroeder)

Infantilism.—The above case is the most marked example of the exception to the rule that I have ever encountered in infantile pelvic organs. Such cases are rare and are not always distinguished from anteflexion and stenosis of the cervical canal which is a persistence, though to a less degree, of the infantile uterus and is accompanied by a much higher rate of fertility. This is always a congenital condition and the associated lack of fertility is due to the immaturity of the uterus and not to the angle of flexion of the cervix or the cervical canal, as is so often erroneously taught.

Absolute sterility, while it may be due to causes already mentioned, is many times an acquired condition produced by changes that either

so affect the function of the ovaries as to prevent proper ovulation or destroy the transmitting or incubating powers of the genital tract. Inflammatory thickening of the cortex of the ovary thus preventing graafian follicle rupture with discharge of the ovum, and inflammatory occlusion of the tubes are concrete examples of this.

Suspension of Ovarian Activity.—That ovarian activity may be suspended over a considerable period of time other than that of pregnancy and lactation, when the suppression is physiological, is well recognized. There is undoubtedly a very close relationship between menstruation and ovulation though just how close remains as yet to be decided, for menstruation may continue regularly in the absence of ovulation just as ovulation may take place when menstruation is suppressed, as instanced by the many cases where conception takes place during lactation, before menstruation has been re-established. While suppression of ovarian activity for a comparatively short space of time is occasionally seen in certain diseases, such as anemia and the severe exanthemata, and for somewhat longer periods in tuberculosis, myxedema, and cretinism, it is rare to find prolonged cessation in women enjoying good health. The longest period of temporary cessation with subsequent conception that I have ever met with, and a case which is a very good example of the close relationship existing between menstruation and ovulation, was that of Mrs. T. S., cited on page 136.

SHOCK.—Grave mental shock, severe nervous strain, and serious, anxious care may all cause a temporary cessation of menstruation, but whether they likewise suppress ovulation it would be difficult to determine. The sudden death of a near and dear relative can produce a premature menopause, and I have seen this occur in comparatively young women at times as early as the thirty-fifth year. A severe post-partum infection can cause a long period of temporary sterility, even when there has been no accompanying occlusion of the tubes, as can also an aggravated auto-intoxication following childbirth. Prolonged lactation, as well as the administration of large doses of pituitrin or ergot after labor, may produce a superinvolution of the uterus, leading to a long period of sterility.

Nutrition.—It has been maintained for some time by certain investigators that the dietary was an important factor in sterility and fertility, and that certain diets, especially those rich in proteins, exerted a marked beneficial effect on reproduction in both quality and quantity. McCallum, Osborne and Mendal have pointed

out that diets lacking in the mineral salts, especially calcium, and in a sufficient amount of the proteins, produce a lowered fertility.

With these views animal breeders have long been in accord, and among them it is an established custom to give rich protein diet to favor successful reproduction. Recently Reynolds and Macomber have carried out a most instructive series of experiments with white rats along these lines. Their investigations show that dietary deficiencies carried to the extent even to produce ill health, result in a high percentage of infertile matings; that many of these victims were incapable of reproduction when remated with highly fertile partners; that the degrees of infertility so produced could be estimated with a fair degree of certainty, and that it was possible to approximate a threshold of fertility below which reproduction does not occur. They drew the following conclusions from their laboratory experiments:

(1) That a moderate decrease in the percentage of the fat soluble vitamine of the protein or of the calcium contained in an otherwise excellent diet produces a definite decrease in the fertility of individual rats.

(2) That a slight decrease in the fertility of both partners will produce a sterile mating.

(3) That the fertility of the mating may be stated as the product of the fertility of the individuals concerned.

(4) That if the index so obtained falls below a given point the matings will be sterile, and that this result holds true whether the partners are of equal or of widely different fertility.

(5) That these principles explain the fact that two individuals which are sterile when mated together may nevertheless reproduce freely when mated to new partners (of higher fertility).

(6) That dietary deficiencies produce a lowered fertility which varies in degree with different individuals though of the same parentage and in the same cage.

(7) That diminished fertility sometimes results in the appearance of abortion.

(8) That mere percentage deficiency in both proteins and calcium produce visible ill health and great infertility.

OBESITY —Obesity is a condition that has long, even since the time of Hippocrates, been noted as having a very direct bearing on the reproductive function. Fat women are not as fertile as their thin sisters. A rapid accumulation of fat is frequently accompanied by an absence of menstruation, flashes of heat and cold, and sterility, all symptoms of

a cessation of ovarian activity. Oliver says, "I have frequently remarked that women who tend to lay on fat rapidly are apt to become barren." It is no unusual experience to find such women enthusiastically imagining themselves pregnant, and even imbuing their physician with an equal degree of enthusiasm that carries them both to the expected date of confinement before the error is discovered.

CLIMATIC CHANGES.—Wide change of climate will frequently produce a temporary suspension of menstruation, and I have had many women under my care, who, on coming to this country from distant parts, suffered from amenorrhea for a number of months. In one patient the amenorrhea lasted for eight months before her menstruation reappeared. Usually acclimation takes place in a few months and menstruation then continues normally. I have never known one of these patients to conceive during such a period of amenorrhea.

EXCESSIVE COITUS.—Over indulgence in sexual intercourse is generally supposed to have a deleterious effect on fertility, and my experience leads me to believe that such is the fact. In such cases, if a long period of sexual rest is practiced, it is not unusual for conception to occur promptly on the resumption of marital relations.

X-RAY EXPOSURES.—The sterilizing effect of the X-ray is also well recognized, and prolonged and repeated exposures result in atrophy of the ovaries, with a corresponding cessation in their activity.

Age has a marked bearing on fertility, and while conception is possible at any time from the beginning of menstruation (puberty) to its close (menopause), there are certain ages which are more fertile than others. From the investigations of Matthews Duncan, twenty to twenty-four years of age may be taken as the period of maximum fertility for the female, so that early marriages are highly desirable from the standpoint of fertility. Duncan's comments on the results of his studies were most interesting and he concluded "that about seven per cent of all the marriages between fifteen and nineteen years of age inclusive are without offspring; that those married at ages from twenty to twenty-four inclusive are almost all fertile; and that after that age, sterility gradually increases according to the greater age at the time of marriage." His study of this question still remains the standard, and its accuracy has never been challenged.

Acquired Sterility.—Acquired sterility may be either absolute (tubal occlusion) or relative (fibroids, displacements, endometritis). While disease or injury can so affect or close the genital passages as to preclude intercourse, and thereby render conception impossible,

inflammation of the fallopian tubes is probably the most important cause of acquired sterility. Such inflammation is in the overwhelming majority of cases produced by gonorrhea. The ravages of this disease generally so seals off the tubes as to make the sterility absolute, and from which the woman never recovers except through surgical measures. But a very small percentage of occluded tubes is the result of outside involvement from the spreading inflammation of appendicitis or pelvic peritonitis.

Gonorrhea is more prevalent than syphilis and while not so fatal to the individual or his progeny is yet the cause of far greater ill health to the community. It is a disease in which it is often difficult to effect a permanent cure, and in many cases that are supposedly cured, the infected organism may still lurk in some portion of the generative tract entirely unsuspected, only to break out afresh in after years.

While gonorrhea is a sufficiently serious disease in the male, it is vastly more so in the female, being responsible for from fifty to eighty per cent of all cases of chronic inflammation of the pelvic organs. Its ravages render the great majority of such cases chronic invalids for life. Syphilis, on the other hand, is one of the main causes of death of the fetus, both in early and late pregnancy, and is a frequent cause of abortion, premature birth, and fetal death during labor. In England and Wales it has been estimated that 27,000 deaths occur annually from syphilis during the ante-natal, intro-natal, and neo-natal periods. In the urban districts, twenty-five per cent of the total ante-natal deaths and deaths during the two to three weeks after birth were due to a syphilitic infection of the fertilized ovum or fetus; while twenty per cent would seem to be a fair average for the whole of England and Wales. In the United States, general statistics are unavailable, so that we are obliged to fall back on hospital records. In 10,000 consecutive labors reported from the Johns Hopkins Hospital in Baltimore, thirty-two per cent of the total deaths up to fourteen days after birth, were due to syphilis, while in the Sloane Hospital in New York, nine per cent of the still births were syphilitic. It has been calculated that among the working classes at least eight to twelve per cent of the adult males have acquired syphilis and at least three to seven per cent of the adult females are similarly infected.

The fetus *in utero* is, as a rule, amply protected by the security of its domicile, not only from accidents but also from maternal infection by virtue of the distribution of all ferments derived from the cells of the feta chorion. These ferments or their derivatives act as a very

efficient chemical filter, destroying or breaking up into granules germs such as the tubercle bacilli and the spirochæta pallida of syphilis. It has been shown by Noguchi that these granules, in the case of spirochætes, while they may remain inactive biologically over long periods of time, can later develop into mature spirochætes with fully retained powers of infectivity. If the chorion ferments are able to control the activity of the granules during pregnancy, as it would seem quite probable they are, then with their disappearance after delivery, it would be quite possible for the granules to develop into mature organisms so that clinical symptoms of syphilis would appear in both parent and offspring. These views are in harmony with the fact so often demonstrated clinically, that active anti-syphilitic treatment of prospective mothers during their period of gestation prevents many an abortion or still-birth and often results in the birth of a living child without blemish or taint. When such treatment has been intelligently and faithfully persisted in, even though it was not begun before the middle period of pregnancy, I have frequently seen their first living baby born to women where repeated abortions and still-births had previously been the rule.

Chronic inflammation with a thickening of the lining membrane of the uterus (endometritis), whether the result of post infection, or consequent upon a displacement of the uterus, acts as a frequent cause of sterility by interfering with the proper imbedding and growth of the fertilized ovum; while a chronic inflammation of the cervix either from infection, displacement, or laceration, will often cause sterility by producing a plugging of the cervical canal with an excessive and pathological glandular secretion which serves as a very efficient barrier to the passage of the spermatozoa.

Fibroid tumors of the uterus bear a most important relation to fertility. While it is quite true that many women grow fibroids and babies indiscriminately, and in large numbers, as a general rule, these growths promote sterility and retard fertility. Some writers have taken the stand that they are a result of the sterility and not a cause. Giles has reported a most interesting and valuable study on the absence of pregnancy as a cause of fibroids based on 566 cases. In this series all the patients were married women who had fibroids, yet sixty per cent had never been pregnant. In support of his contention "that they developed fibroids because they had not become pregnant," he gives two reasons: first, that they had been married long enough to have been pregnant, seventy-five per cent over five years, and forty-seven

per cent over ten years; and second, that the great majority had been married a long time before the fibroids had developed, there being only a few cases in which the fibroid history went back more than three to five years. But it is difficult to say when any fibroid first began to grow, and quite small growths may early occlude the cervical canal, or obstruct the tubal opening, preventing the passage of the spermatozoa, or, when in the uterine cavity, so thicken the endometrium as to prevent a successful imbedding of the fertilized ovum long before the tumor has reached a sufficient size to make a diagnosis possible.

FIBROIDS.—Fibroids are by far the most common of all uterine neoplasms, and there can be no doubt but that clinical records greatly understate their frequency. This is due probably to the fact that unless they enlarge sufficiently to attract attention or produce well recognized clinical symptoms they are often overlooked.

Closely akin to fibroid tumors as a cause of sterility, or at least as a factor in diminished fertility, is the condition known as general uterine fibrosis, where there is a replacement of the muscular tissue of the uterus by fibrous tissue. This causes a thickening of the endometrium and uterine walls which is associated with profuse menstruation and at times actual hemorrhage. In both fibroids and general fibrosis, the accompanying hyperplasis of the endometrium renders it an unfavorable soil for the lodging and maturing of the fertilized ovum, and the same is true of the post-partum sub-involuted uterus. A comparatively small fibroid, when situated in the uterine wall or uterine cavity, is more likely to interfere with pregnancy and to be a cause of relative sterility than a large pedunculated one lying outside of the uterus. The reason for this, I believe, is that the inter-uterine and intra-uterine tumor, being an irritant foreign body, the uterus is continually contracting in its endeavor to expel it, and this contraction or hyper-muscular activity keeps the uterus in an almost tonic state of contraction which eventually throws out the fertilized ovum even when imbedding has occurred. It is not unusual in these cases to find the uterus hypertrophied to several times its normal size. When the fibroid is removed the uterus will involute, just as it does after labor, returning in a short time to normal, or practically normal size, and pregnancy not infrequently follows the operation with gratifying promptness. The subperitoneal fibroids seldom ever interfere with pregnancy, and are not often found to be a cause of sterility because they have been driven out of the uterus, which has then subsequently involuted and returned to a state of quietude such as invites

pregnancy.   This theory seems to me to cast considerable light upon those cases where fibroids are found associated with long periods of sterility, following which conception spontaneously occurs.

Malignant tumors of the uterus are a very efficient barrier to conception, for which we should be duly thankful.

RETRODISPLACEMENTS.—Retrodisplacements of the uterus play an important part in sterility and fertility, but to just what extent is still a matter of considerable difference of opinion, and perhaps justly so. They have been held accountable by some for nearly every ill and ailment to which woman is prone, and by others swept aside as utterly unimportant.   I believe they should be considered as among the more frequent causes of sterility.   In this respect it is quite necessary to distinguish between congenital or acquired, and minor and major displacements.   In the congenital type of case, the uterus is usually immature and the sterility probably due to the inability of the undeveloped organ to properly function, a common weakness with all undeveloped organs, and one that is not peculiar to the uterus alone.   The retroposed uterus, whether of the congenital or acquired type is by virtue of its impaired circulation, in a state of chronic venous congestion, a condition unfavorable to conception, and even when conception occurs, early abortion is the rule unless restitution to normal position takes place spontaneously or is induced.   These cases often undergo repeated abortions without ever carrying a pregnancy to term as spontaneous restitution is the exception rather than the rule.   In cases of habitual abortion due to this cause, if the uterus be replaced, the next pregnancy will usually go on without interruption to term.   What has been said regarding the minor displacements is true likewise of the major displacements, though to a less degree.   This class of displacements does not often enter into the question of sterility, but prolapse of the uterus is the one which has to be occasionally considered.   When the prolapse has not progressed beyond the first or second degree it results in but slight impairment of the procreative function of the woman, but complete or third degree prolapse is attended by a high rate of sterility and a greatly lessened fertility.

Regarding the influence of tumors of the ovary on sterility and fertility, little of value can be said from a statistical viewpoint, and the subject has to be considered in a more or less general manner.   Obviously when only one ovary is the seat of disease, the other being healthy, there need be no interference with conception, and unilateral

tumors should not be classed as a cause of sterility, but rather as a possible cause of lessened fertility. The question of a bilateral involvement is of much greater importance. The nature of the new growths has much to do with the prognosis. Women with malignant neoplasms and dermoid cysts, growths which are usually bilateral, are as a rule sterile; while women with benign ovarian cysts frequently conceive, and cases of pregnancy with double ovarian cysts have been reported. A high rate of sterility and a low rate of fertility is the rule in patients with ovarian cysts, and the fact that these growths very frequently complicate pregnancy, either interrupting or necessitating the interruption of the pregnancy, justifies their consideration as a cause of sterility, at least of relative sterility.

INFLAMMATORY PROCESSES.—Aside from new growths of the ovary as a cause of sterility, the inflammatory involvements deserve a more important consideration than is usually accorded them. Quite often the ovaries are found to be enclosed in a veil of adhesions which at times so completely envelop them as to prevent the ovum after liberation from reaching the tubes, yet the inflammatory process which caused these adhesions may not have involved the tubes to the extent of completely closing their entrance. Inflammatory thickening of the cortex and capsule of the ovary will in itself often prevent the liberation of the ovum and thus produce sterility. Such inflammatory conditions are most often the result of postabortive or postpartum infection and are only rarely caused by gonorrhea, which never attacks the ovary primarily. When gonorrhea attacks the ovary, the avenue of approach is through the tube. The possibility of ovarian inflammation as a complication of mumps has long been recognized, and in this regard, typhoid, scarlet fever, and diphtheria should be more thoroughly studied. I have occasionally seen when operating on young girls, even before puberty, extensive inflammatory adhesions surrounding the ovaries and tubes, and matting them down to the broad ligaments, that could very well have been caused by mumps or one of the acute exanthemata, hardly by gonorrhea.

The functional causes of sterility are complex and not easy of enumeration. Good health, plenty of out-door life and exercise, are all favorable to fecundity, while luxury and wealth with their attendant evils go hand in hand with sterility.

Alcoholism.—Parental alcoholism may cause serious injury to the germ cells, as has been shown by Stromayer, Witterman and

Grossman, and their conclusions are strongly confirmed by the experiments on alcoholized animals carried out by Stockard. In his investigations he found that normal males mated with alcoholized females gave forty per cent still-born or offspring that died within three months in contrast to only 13.55 per cent with normal mates. In the series of normal matings there were no defective young, while the alcoholized series showed ten per cent defectives.

All the evidence in the case thus far collected would tend to establish beyond a reasonable doubt the fact that parental alcoholism exercises a very definite, injurious influence on the birth rate from a quantitative as well as a qualitative point of view, and that alcohol as a racial poison plays a very real part in decreasing fertility.

There can be little doubt that postponement of the age of marriage, whether by social factors, false notions of the standards of living, or for economical reasons, has been prejudicial to society and has resulted in a serious increase in immorality. This has greatly interfered with and decreased the normal production of healthy lives. When the individual arrives at the proper physiological age for marriage, the sooner legitimate mating takes place the better for morality and for society. The postponement of marriage after this age is reached cannot but result in social unbalance, and in many ways it is one of the greatest sources of discord in our modern civilization.

Great stress has been laid upon the injurious effect of repeated child bearing to the woman and this has been brought forward prominently in all birth-control propaganda. Luther's remark regarding the mother who died early, worn out by excessive child bearing, "What matter? It is what she is here for," has been often quoted in such "literature," but frequent child bearing, during the favorable reproductive period of a woman's life, does not necessarily wear her out nor bring her to an early grave. Indeed, the great majority of women are never in such good health as when carrying or nursing their children. It is rather on the shoulders of indifferent and careless obstetrics that the blame should be placed. The need of better attention during pregnancy and confinement is a vital one, and in no other department of medicine or surgery is the care of the patient fraught with greater responsibility. It is difficult to contemplate without a shudder the vast horde of women being continually condemned to lives of chronic invalidism by ignorant midwifery; the countless operations yearly performed to correct the damage done by unskillful obstetrics; the

annual erection of tombstones to those who become martyrs to the cause, without fervently praying for the early arrival of the day when the practice of this all-important branch of medicine will be limited by law to those specially qualified to practice it, and with a paternal government, humane enough and farsighted enough to zealously guard the interests of all its prospective mothers.

Alcohol, vice, and immorality are responsible for a large percentage of sterility. It is a false and vicious standard of morals which opens every door to the prodigal son, but which closes every door to the prodigal daughter. I believe that if any difference exists, it should be in favor of the woman, who in many instances has not only to resist her own physical instincts but also the continual attack of man.

Physical and Mental Incompatibility.—Sexual gratification of the female on intercourse is not necessary to conception; nor does its absence preclude conception, but incompatibility of sentiment is often a factor in causing sterility. There are certain varying degrees of affinity which are unfavorable to fertility. Consanguineous marriages have an evil influence. A single child, the feeble fruit of worn-out stock, is usually low in fertility. Three years of married life should pretty well decide the question of probable sterility, for it has been estimated that only about seven per cent of the fertile bear their first child after that time.

We must not lose sight of the fact that in cases of sterility, the sexual organs or functions in both the male and female may be in a perfectly normal condition and that the sterility may be due to physical incompatibility of sentiment; in other words, that sterility may be more relative than absolute. This is borne out by many instances where the husband and wife, having lived together for many years without issue, separate and remarry and each has a family by the new partner. Also, numerous cases have been reported where the wife was sterile to her first husband who had had children by a former wife, and yet after the death of this husband promptly conceived when married a second time.

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CHAPTER VIII

ETIOLOGY—DIAGNOSIS—TREATMENT

Unfruitful marriages—Quality of spermatozoa—Vitality, number, and motility of the spermatozoa—Diagnostic importance of vaginal and cervical smears—Uterine displacements—Male sterility—Study and examination of the male—Imperfect sexual relations—Study and examination of the female—Rectal examination in stout subjects—Post coital tests for sterility—Determining the potency of the fallopian tubes—No infallible test of sterility—Treatment of sterility—Hygienic measures.

Unfruitful Marriages.—Many different factors may contribute in part or in whole to the tragedy of an unfruitful marriage. In the male, the absence or poor quality of the spermatozoa, defective anatomy, and pathological conditions which destroy the spermatozoa either before or during ejaculation have been mentioned. In the female, the spermatozoa may be destroyed in the vagina or after reaching the cervix or even the uterus, or ovulation may be defective or absent entirely. Of fascinating interest is the histological study of the spermatozoa, the process of ovulation and fecundation, and the vaginal and uterine secretions in their bearing on sterility. Along this line the work of Reynolds, Lespinossi, Huhner, Detlefsen, and Rohleder deserves the greatest praise, and these should be read in full in order to gain a clear understanding of the details and technical methods used.

Quality of Spermatozoa.—A few motile spermatozoa found in the semen do not by any means give a reasonable hope of fertility. Lade has estimated 200,000,000 as the number of spermatozoa present in a single ejaculation, only one of which eventually produces the impregnation. With such a great numerical waste, quality, rather than quantity becomes the important consideration, yet Detlefsen, upon dividing 433 specimens of semen into four classes according to the numerical distribution of spermatozoa, and then again into four classes with reference to motility, found by subsequent breeding experiments that without exception an animal might be regarded as sterile unless both numerical frequency and motility were at least of the second

class; i.e., unless the animal was in one of the first four of the sixteen classes so produced.

Vitality, Number and Motility of the Spermatozoa.—Reynolds's studies have gone even farther and tend to show that in estimating the fertility of the male the vitality of the spermatozoa must be studied as well as their numerical frequency and motility. His work in this respect is of great clinical value and has led to the development of a comparatively rapid method for the estimation of vitality.

Vaginal and Cervical Smears.—After a careful inquiry into the patient's past and present marital relations a thorough microscopical examination of smears taken from the vagina and cervical canal within two hours after normal intercourse should be made. These will readily demonstrate the presence or absence of spermatozoa. It is not unusual at this time to find only dead spermatozoa in the vagina, but from the cervical canal it should be possible to obtain live and active examples. In making a large number of such examinations one cannot but be impressed by two important facts: (1) that far less often are spermatozoa found in the genital tract of sterile women than in fruitful ones. (2) Rarely if ever are spermatozoa found in the cervical canal beyond the occluding mucus plug of a chronic cervicitis. Though I have repeatedly found them enmeshed in the mucus plug in multipara as well as in nullipara, and in the former occasionally beyond the barrier of the plug, I have rarely found them to have penetrated the plug and reached the cervical canal beyond in nullipara. In nullipara the cervical canal is small, and where chronic cervicitis exists, always more tightly plugged than in multipara. Frequently in these cases, it is possible by suction with the Bier's cup to draw out a complete mucus cast of the cervical canal.

When these microscopical details have been elicited, the physical examination should next be taken up. By the bimanual abdominal and vaginal examination the size, position, and mobility of the uterus are determined, and any abnormality in the region of the adnexa noted. The infantile type of uterus is unfavorable to fecundity, as is the small, anteflexed organ. Conception, to be sure, occasionally occurs in the undeveloped uterus, but this is the exception rather than the rule, and the first pregnancy seldom goes on to term, early abortion generally resulting. The added development which the uterus acquires as a result of this miniature labor is then usually sufficient to enable it to carry the next and succeeding pregnancies to a successful issue. In the

infantile uterus, where pregnancy has never taken place, much may be accomplished in selected cases by dilating the cervix and packing the uterine cavity tightly with gauze. This method of treatment, in imitation of nature, stimulates the uterus and frequently results in a further development that cures the sterility.

Uterine Displacements.—The anteflexed uterus is a maldeveloped type, and, although it does not carry with it a normal rate of fertility, is, by no means a barrier to conception. Many such uteri undergo even repeated pregnancies and in quite a large percentage the anteflexion persists. In all probability the high rate of sterility and the low rate of fertility in anteflexion is due to the undeveloped condition of the organ rather than to the angle of flexion, and I cannot but feel that the various operations so frequently advised for the correction of this angle of flexion, with the idea that it is an etiological factor in the sterility, are ill advised.

Displacements of the uterus, especially retroflexion, should be corrected, because the congestion in the organ with the thickening of the endometrium resultant on the displacement lessens very materially the chance of a permanent imbedding of the fertilized ovum. The replacement can often be accomplished by nonoperative means, and these should, as a rule, always be given a trial first. The pessary to hold the uterus in place is of great value in the treatment of relative sterility due to this cause. Laceration of the cervix through the internal os, and lacerations accompanied by marked erosion or chronic inflammation of the cervical glands, should be repaired. Subinvolution of the uterus may be an indication for curettage if it does not yield to simpler methods of treatment. The tumors of the uterus usually call for their removal. Enlargement of the adnexa is an indication for their operative inspection when the tubes will often be found closed. After opening the occluded end, the tube should be probed its entire length into the uterine cavity to make sure of its patency, and occasionally an obliterative salpingitis involving the whole tube will be encountered, although it is more common to meet with only partial obliteration. Rarely, if ever, is a tube found occluded at its cornual end when the rest of its lumen is free.

Sterility in the Male.—The importance of the part played by the male in sterile marriages has, up to a comparatively short time ago, not been sufficiently recognized. It has been a question seemingly so confused, or rated of so little consequence, that few writers have tried to understand its real significance.

This state of affairs has been extremely unfortunate, because it has hindered a clearer understanding of the subject of sterility, thrown much unfair blame on the female, and prevented the acquiring of information most valuable in diagnosis, prognosis and treatment. Furthermore, the neglect of this subject has rendered the statistics, and a great part of the writings of the earlier investigators of little or no present use. Even to-day few physicians have made themselves familiar with this subject, and, as a result, there are many professional minds in which it is still shrouded with the mystery which begets ignorance.

The fertilizing element, the semen, is the product of the male genital organs, and consists of a mixture of various gland products derived from the sexual apparatus; the testicles, the seminal vesicles, the vas deferens, the epididymis, Cowper's glands and the prostate gland all being contributors. The details of the preparation of this fluid is far from having been satisfactorily explained, but the greatest interest centers around the seminal corpuscles, or, as they are more often called, the spermatozoa. These come from the testicles, and each has a very definite entity, consisting of a head, a middle piece and a tail (Fig. 11, p. 35). The head, or as it may properly be called, the nucleus, is the important fertilizing element, and measures about 0.0006 millimeter. The tail is the organ of propulsion, and at the full height of its vitality is able to drive the spermatozoa forward at the rate of from 2 to 3 millimeters a minute.

The spermatozoa do not normally leave the testicles until the time of ejaculation, and the presence of these sperm corpuscles in his semen determines the fertilizing power of the man.

Under favorable conditions the spermatozoa are very tenacious of life, withstanding considerable variation in temperature, and have been found to retain their vitality in frozen semen for six days, and in an incubator at a normal blood temperature for eight days. Extremes of temperature, above 47° and below 15° centigrade, destroy them. They have been found alive in the female genital tract for a period of twenty-five days. Alkaline fluids favor their life, while acid media hasten their death.

Virility in the male usually begins with the eighteenth year, and from then on increases up to about the fortieth year, after this there is a gradual but progressive decrease in power, although its ending is not marked by a definite climacteric, as is the case in the female. By

the sixty-fifth year comes usually a complete extinction, though some retain their sexual power well into the seventies, and a few to even more advanced years.

The first duty of the physician when consulted in a case of sterility is to decide whether or not the man is fertile, and, judging from my own experience with these cases, a much larger percentage of the men than is generally conceded are found to be sterile..

I firmly believe that in every sterile marriage, no matter how gross the lesion found in the wife, the possible responsibility of the husband should never be overlooked, and that his condition, therefore, should be thoroughly investigated before placing the blame on her.

The question of fertility or sterility is, in the man, one much easier of decision than in the woman, and is, in the majority of cases, one well within the ability of the general practitioner to decide.

In order to successfully impregnate his partner it is necessary for the man to do more than merely accomplish the sexual act. With many, however, a successful cohabitation is taken to be a sufficient guarantee of his fertility, and often no further proof is required. This view of the matter, commonly accepted by the laity, is only too frequently shared likewise by physicians. The male must be able not only to properly perform the sexual act but to deposit live and healthy spermatozoa in plenty in the cervical canal, or at least in the immediate vicinity of the cervix. This takes place at the time of ejaculation, and while, in certain cases, impregnation has resulted from the simple deposition of the spermatozoa in the vagina, or even on the external genitalia, without any penetration, such instances are rare, and are the exception to the rule.

If, then, his spermatozoa, normal and healthy, are found on examination at the external cervical os, the husband can be freed from all responsibility for the sterility. The specimen (Condom) test so often depended upon is unreliable unless spermatozoa are never present, and, even when found alive and in plenty on repeated examinations, he may still be sterile from the presence of some congenital or acquired defect that during normal intercourse prevents the proper ejaculation of the spermatozoa against the cervix.

Inability to properly perform the sexual act is known as "impotentia coeundi," while inability to procreate, or sterility, is called "impotentia generandi." As any deformity which makes proper cohabitation impossible will likewise prevent conception, absence of the

penis or its diminutive size, or well marked hypospadias or epispadias, may all be causes of sterility, and, with organic lesions of the central nervous system controlling the sexual function, are known as organic impotence.

While the above-mentioned conditions may be, and often are, the cause of nonimpregnation, they may at times be a deterrent factor only, and be overcome and impregnation successfully brought about if the semen is normal. Thus, true sterility in the male may be said to exist only in the absence of semen (aspermia) or when there are no spermatozoa present in the semen (azoöspermia). When the semen is present, yet shows a marked decrease in quantity, or in the amount of its fertilizing constituents, the condition is spoken of as "oligospermia."

Aspermia may be caused by the inability of the semen to pass through the genital canal, the obstruction to its passage being either congenital or acquired. In the former the sterility is usually absolute, while in the latter it may be only relative, the result of injury, general physical deterioration, or the same causes that produce the various nervous forms of impotence.

Again, partial or complete absence of spermatozoa may be either temporary or permanent.

As the spermatozoa come from the testicles, testicular absence or disease may be a cause of sterility, and, likewise, the absence of the epididymis or the inflammatory occlusion of the spermatic duct may be the factor responsible.

A physiological diminution or complete absence of the spermatozoa is seen in various constitutional diseases, such as alcoholism, chronic seminal vesiculitis, prostatitis, posterior urethritis and from a too frequent sexual indulgence, as is the case in the sexual bankrupt. When the aspermatism is absolute a proper ejaculation may never have been accomplished, as is the case when it is of congenital origin, or there may be only a partial or temporary failure, as seen in the acquired types, yet these may be as complete and permanent as though congenital.

The most frequent local causes found to be responsible are malformations and twists in the posterior urethra, the result of traumatism, whether from injury or operation, and as a result of which the semen is thrown back into the bladder, and not forward through the anterior urethra.

Absence of the testicles (anorchism) is, of course, a cause of absolute sterility, while the condition of undescended testicle (cryptorchidism) when present usually causes sterility. Bilateral closure of the spermatic duct at any point in its course from the epididymis to the ampulla of the vas deferens is most often the result of inflammation, and causes absolute sterility. Gonorrhea is the greatest factor in causing such inflammation, and is generally considered in male sterility to be a more important factor than are all other causes combined.

Psychical Impotence.—Numerous cases are encountered where the impotence is purely psychical, and these should be placed in a class by themselves, although it is the custom with many to include cases of sexual perversion associated with impotence in the same class. In the perversion cases, while impotence is frequently associated with the perversion, it exists only as an associated factor, and is not a chief characteristic.

In psychical impotence virility is absent, being inhibited by psychical processes, but sexual desire is normal. This psychical inhibitory power results usually in an absence of erection and ejaculation, though, in some, ejaculation may take place even without erection.

There are various kinds of psychical processes that lead to impotence but they are all generally based upon the emotions, and the most usual one is the fear in the mind of the man that on trial he may prove to be impotent. The majority of these patients are of the neurasthenic type, whom sexual excesses, usually in the form of masturbation, has robbed of a certain degree of their manhood, leaving them fearful of a successful result when they come to face the final test. Another quite common inhibiting emotion in my experience is the fear on the husband's part of impregnating his wife, and thus subjecting her later to the sufferings of labor, which, in his mind, are greatly exaggerated. In one of my cases of sterility this was the state of mind of the husband who, shortly before marriage, had been forced to listen the night-long to the labor cries of an unanesthetized woman in a neighboring room. Occasionally a husband is met with who considers any sexual feeling as a profanation of their love, and a direct insult to his wife.

There are many other emotions which at times produce a marked fear of, or a distaste for, intercourse, and that are capable of preventing erection, and thereby causing impotence.

The X-ray exerts a marked sterilizing influence on both male and female. Prolonged and frequent exposure in the male destroys the spermatozoa, but does not affect the power to cohabit.

From a perusal of this necessarily brief enumeration of the more important conditions which influence, to a greater or less degree, sexual virility, it will be readily seen that there are at times so many and such varied causes leading to sterility that questions of diagnosis and treatment require a special treatise by themselves. For this the reader must turn to the literature of urology.

The whole question of male sterility is of great individual and social importance, for, as Vecki says, "without virility there can be no procreation." Impotence, when premature, often transforms the whole character of the man, producing changes that alienate his wife, his children and his friends, often bringing failure when success seemed assured, and leading inevitably to the wreck of his home and the blasting of his career.

Study and Examination of the Male.—In taking up the study of an individual case of marital unfruitfulness, various important points must be kept constantly in mind. While it is true that too much stress is at times laid upon the part played by the female, and many a woman unjustly blamed as the cause of the sterile marriage, it is likewise true that the fertility of the male is far too often taken for granted. Male sterility is just as important as female sterility, and in all probability fully as frequent. In many childless marriages the cause can only be determined by microscopic examinations, so that to make a diagnosis of the cause of the sterility calls for a detailed microscopical as well as a physical examination. The examination of the man is best carried out by the urologist, whose complete report should be in the hands of the gynecologist when he starts his examination of the woman. The examination is now begun by taking a careful and thorough history, going into even the most minute details, and should then be followed by a general physical as well as a careful local examination. The history should cover fully the ground of the venereal diseases and any general infection from which the patient may have suffered, with special reference to any past attack of peritonitis, so called, or appendicitis. A statement by the patient suggestive of any pelvic or abdominal involvement, past or present, should be most thoroughly investigated. If contraceptives have been used over any considerable period of time, the measures employed should be

inquired into. The fertility of the parents and, when accessible, that of the grandparents should be noted. The next question to be taken up is that of the menstruation, and any abnormality in this respect calls for careful investigation. This may show a late onset, with scanty, irregular, and painful periods, suggestive of undeveloped pelvic organs, or a profuse and too frequent flow, pointing towards a retro-displacement, subinvolution, or the presence of a uterine fibroid. When several months are missed at a time, and the patient has "flashes" of heat and cold, the menopause may be judged to be impending. Follow-ing the taking of the menstrual history, the patient should be asked if there is any leucorrheal discharge, and if so, its character. A thin, white discharge is indicative of chronic endometritis, while a thick, stringy, white or yellowish discharge usually accompanies a chronic inflamma-tion of the cervix. When the discharge is profuse and purulent with marked symptoms of vaginal inflammation and frequent urinations, gonorrhea should always be suspected.

Pain is an unreliable symptom on which too much importance is often placed. When accompanying menstruation, it is most often indicative of undeveloped organs or the presence of fibroids, while when present between menstruations would point more to inflamma-tion, new growths, or adhesions of the adnexia. Sacral backache, while generally associated with retrodisplacements, is very frequently present without any discoverable cause, and is one of the least under-stood of gynecological symptoms.

Imperfect Sexual Relations.—Now comes a careful inquiry into the patient's sexual relations, which will surprisingly often elicit the fact that a normal intercourse has never taken place. This may have been only the result of ignorance as to how to properly perform the act, or a successful consummation may have been pre-vented by some pathological obstruction, such as a rigid hymen or atresia of the vagina. Again, intercourse may never have been suc-cessful because at each attempt the patient was thrown into such a spasm of nervous fear as to render it impossible (vaginismus), or because all attempts at coitus proved so painful that it was not per-sisted in (dyspareunia). Both vaginismus and dyspareunia are quite frequent causes of sterility, the former is functional and at times very difficult to cure, but the latter is generally dependent upon some inflam-matory disease of the vulva, vagina, or pelvic organs, and usually yields to appropriate treatment.

Study and Examination of the Female.—A carefully taken and thoroughly studied history will often point the way to a correct diagnosis of the cause of the sterility. Many times even before this is completed, one has often gained a pretty clear idea as to just where to look for the seat of trouble, but this fact should not be allowed to lead to neglect in the slightest degree any detail of the subsequent examination. It is important to bear in mind in this connection that there are many more or less pathological conditions encountered in women which, while they may and often do produce active symptoms of one kind or another, have yet in themselves no bearing on either her sterility or fertility.

The local examination of the patient which follows should be deliberate and thorough, yet always conducted with due regard for her feelings, both mental and physical. Extreme gentleness is necessary at all times, especially in palpating the pelvic organs. To cause pain by the examination greatly increases its difficulty, often defeats its object, and frequently drives the patient elsewhere. If your first examination is not entirely satisfactory, do not give an opinion until you have made a subsequent one that is.

While the examination is being conducted, the patient should lie on the table comfortably relaxed, with her legs supported in stirrups and suitably draped. The external genitalia are first inspected and carefully examined for any abnormality in development or sign of inflammation, past or present, of the vulvo-vaginal glands, their ducts, or the peri-urethral gland ducts. Inflammation of these structures is highly significant of a past attack of gonorrhea. A vaginal speculum is now introduced and by shifting its position, the walls of the vagina are carefully examined. Smears of any discharge should be made for microscopical study and the chemical reaction of the vaginal secretion tested; for a highly acid secretion has a lethal effect upon the spermatozoa and, therefore, an important bearing upon the question of sterility. The cervix is now examined for any extensive erosion, either congenital or acquired. Such are often associated with a chronic cervicitis and accompanied by a profuse discharge that so constantly plugs the cervical canal as to often effectually exclude the spermatozoa. Acquired erosion of the cervix is the result of laceration, and any extensive laceration should be investigated; for these, when they involve the internal os, are a very frequent cause of habitual abortion.

The size of the external os is of importance, for, although the so-called pin-hole os may not in itself be a cause of sterility, such a

minute opening is more easily plugged by mucus and the spermatozoa thereby excluded. Mucus blocking of the cervical canal should therefore always be investigated, and it is important to distinguish between the thin, glairy, translucent mucus, which is normal, and the thick, tenacious, opaque mucus, which is pathological. Smears from the cervical canal should be examined for infective organisms, and the reaction of its secretion tested. An abnormally high alkalinity is detrimental to the life and activity of the spermatozoa, just as is a high degree of acidity in the vagina.

We next come to the bimanual examination of the uterus and adnexa. This should first determine the position, size, and mobility of the uterus, and the information thus elicited is often of the greatest importance. An anteflexed, undeveloped, or retrodisplaced uterus is frequently associated with sterility, while restriction in the range of normal mobility points to adhesions, or contraction of the broad ligaments resulting from a past infection of the adnexa. Increase in size of the uterus may be due to subinvolution or to the presence of a new growth (fibroid). If the fibroid is fairly large or multiple fibroids are present, little difficulty should be experienced in making a diagnosis. These tumors are a frequent cause of sterility.

Having clearly made out the position, size, and character of the uterus, the adnexa are next palpated. These are thoroughly but gently examined for the presence of any enlargement, undue tenderness, or adhesions. It is not always easy to distinguish between tube and ovary, for both are often matted together beyond any hope of separate recognition, but when this is the case it is safe to conclude that the tube is the primary seat of disease and is probably occluded. When the condition is bilateral, the sterility can be taken to be absolute.

Rectal Examination of Stout Subjects.—In examining very stout women and those with a small and tender introitus, a rectal examination will many times succeed where a vaginal one has failed.

Normal ovaries may show slight variations in size and tenderness on repeated examination, which must not always be considered as pathological, for these changes are often physiological and accompany ovulation and menstruation, but marked and persistent enlargement of an ovary, especially when there is tenderness present, is usually to be taken as a sign of disease.

The local examination should in all cases be followed by a post-coital one, at which time specimens of the semen deposited by the male are removed from the vagina and cervix and studied under the micro-

scope. Valuable information is to be obtained in this way, but unless the technique is accurately carried out, and the interpretation made by an expert, the result may be misleading. When specimens taken from the seminal pool in the vagina are examined under the microscope, the presence or absence of spermatozoa can be easily determined. If such examinations, made within one hour after intercourse, disclose the presence of spermatozoa, a majority of these will usually be found to have lost their normal motility, or to have it very greatly inhibited. This is probably due to the acidity of the vagina, which is generally supposed to be inimical to the life of the spermatozoa, and the greater the length of time that has elapsed since intercourse, the fewer will be the number of live, motile individuals found. After ten hours or more, live spermatozoa are rarely, if ever, found in the vagina, but in the cervical canal they live much longer and may even be found in an active state days after coitus. The exact period of life of the spermatozoa within the genital tract is unknown. For all practical purposes the examinations made in carrying out the spermatozoa test may be confined to specimens taken from the vagina and cervical canal. If live, healthy spermatozoa are found in the cervical canal, it is unnecessary to search the uterine cavity.

Postcoital Tests for Sterility.—The postcoital test for sterility has many grave limitations, and for a full and comprehensive statement of its value the reader is referred to the writings of Huhner and Reynolds, who more than all others have done so much to illuminate this hitherto dark page of gynecological literature. The method of obtaining specimens for examination offers little technical difficulty. With the patient in the dorsal position a bivalve speculum is introduced and its blades separated, bringing into view the receptoculum seminis and the cervix. A sterilized, narrow, platinum loop is plunged into the pool and the semen adhering to it transferred quickly to a warm slide, which is placed on a warm stage and examined under the microscope, using a low-power objective ($\frac{1}{4}$ to $\frac{1}{6}$ inch) with a high-power eye-piece. Low illumination by means of a condenser show moving spermatozoa quite clearly. The same method is used in taking specimens from the cervical canal, except that the vaginal aspect of the cervix is wiped with sterile cotton and the superfluous mucus removed by aspiration with the Bier cup, which should be applied only for a moment and not left in place long enough to draw blood into the cervical canal. The platinum loop is then gently introduced into the

cervical canal and as gently turned around several times. Any bleeding caused by undue traumatism invalidates the examination.

When all examinations have been made, it is not always an easy matter to determine their exact value in the given case. If the spermatozoa found in the vagina are normal in number and motility, the fertility of the male may, with a few exceptions, be taken as definitely established. When the spermatozoa recovered from the cervical canal are normal in number and motility, the question of the possibility of injury by the female secretions as being a cause of the sterility is settled in the negative.

Determining the Patency of the Fallopian Tubes.—Various ingenious methods for determining the patency or otherwise of the fallopian tubes without opening the abdomen have been devised. Direct probing of the tubes from the uterine end, as well as the injection of solutions through the tube which could be traced by roentgenography have both proved unsatisfactory. Intra-uterine inflation with oxygen, producing, in the presence of patent tubes, an artificial pneumoperitoneum, has been used to better advantage and bids fair to become such a valuable diagnostic aid that I give the technic described by Rubin in full.

"The technic of the procedure is very simple. The instruments needed for the intra-uterine injection are (1) a metal cannula (Keyes-Ultzman type) perforated at the tip by several small apertures; (2) a tenaculum (bullet) forceps; (3) a uterine sound; (4) a dressing forceps; (5) a bivalve vaginal speculum (Graves type); and (6) an oxygen tank connected with a water bottle. The rubber stopper is perforated at three points, through which bent glass connecting tubes pass into the bottle; one of these glass tubes connected with the oxygen tank dips down below the water level. The two other glass tubes dip down for 1 or 2 inches and do not reach the water level. One of these is attached by rubber tubing to a mercurial manometer and the other is attached in the same way to the metal cannula. In order to determine the volume of oxygen gas released from the tank, it is allowed to pass through the water bottle in a stream of discrete bubbles. These should not exceed 300 per minute. The actual amount per minute can then be measured by displacing from 200 to 250 c.c. of water per minute. The same rate is then maintained in the intra-uterine injection. The water bottle connected with the oxygen tank contains hot boiled water or some mild antiseptic solution.

"The cervix is exposed by means of the speculum, the vagina is

carefully wiped clean, and the cervix is cleansed dry and painted with tincture of iodin. If there is any uncertainty regarding the direction of the uterine cavity, it may be determined by passing the sound. The cervix is steadied with tenaculum forceps grasping its anterior lip. The oxygen, which has been released from the tank and regulated, is now allowed to pass from the water bottle through the glass and rubber connecting tubing to which the metal cannula is attached. By pinching the rubber tubing near the cannula one can make sure that all the joints are air tight. The mercury immediately rises in this case. If there is some leakage between the oxygen source and the cannula, the pressure will be negative. This is a very important point to be observed. Having made certain of the pressure, the air valves in the manometer are opened and the catheter is then inserted into the uterine cavity to a point well beyond the internal os. This is done so that there is no immediate escape back along the cervical canal and out into the vagina. The rubber urethral tip, placed ordinarily from $1\frac{1}{2}$ to 2 inches away from the cannula tip, is then fitted into the external os, insuring better obturation. This is not essential in the nulliparous intact cervix, but is required in the irregular, patulous external os resulting from previous operations or from lacerations attending childbirth. The air valves are now closed. Within a few seconds after the oxygen enters the uterine cavity, the pressure as noted in the mercury manometer will rise; within from one-half to three-quarters of a minute in the patent cases, the mercury reaches its maximum point. It then fluctuates for a few seconds or drops rather sharply from 10 to 30 points, maintaining the last level more or less for the rest of the time. There may be a slight audible escape of oxygen from the external os in the cases of patent tubes, but as a rule there is none till the cannula is removed, when slight regurgitation is present.

In the nonpatent cases, the pressure usually rises steadily for three-quarters of a minute to a minute or longer, and then drops sharply as the gas regurgitates into the vagina. As the time required for sufficient oxygen to pass into the abdomen where it can be detected by fluoroscopic examination, is one and a half minutes, the cannula is not withdrawn till this time limit is reached. If the pressure reaches 200 mm. in one minute, it is well to open one of the air valves (needle-valve) to prevent it from mounting higher. In all our patent cases, this high level was not reached.

The intra-uterine gas pressure has been a valuable adjunct in checking up the time required for the gas to pass through the tubes

and reach the peritoneal cavity. In our earlier cases we had decided on a three-minute interval as being necessary. In that time 750 to 850 c.c. were released from the oxygen tank. We had no way of telling when the gas actually passed through the fallopian tubes. The symptoms were naturally accentuated. The pneumoperitoneum was excessive. A liter of oxygen was not necessary, when a quarter of a liter was just as valuable for the purposes of establishing the fact of patency. With the manometer attached to the new water bottle we can decide, knowing the rate of flow beforehand, how much we wish to inject into the abdomen. From the moment the pressure falls, we allow the gas to flow for from one-half to one minute, and can estimate the quantity used with reasonable accuracy, allowing for an error of 50 c.c., which for practical purposes is unimportant.

"In the positively patent cases, the pressure need not exceed 40 mm. The average pressure is from 60 to 80; occasionally the pressure rises to 100 or more before the oxygen will pass through the uterine ostium of the fallopian tubes. When the pressure reaches 150 or more, the likelihood is that the tube lumen is closed completely or stenosed, but not necessarily in every case. A pressure of 200 is tolerably certain to be due to closed tubes. Fluoroscopy, however, should always be employed to check up the partially stenosed cases, as sometimes oxygen will succeed in escaping into the abdomen, though the pressure required to force it in is comparatively high.

"While the pressure gage, as studied in the second series of thirty-seven cases, is an excellent indication of patency of the fallopian tubes. it is well always to examine the patient with the fluoroscope. It occasionally happens that with the greater pressure a slight amount of gas succeeds in entering the peritoneal cavity and reaching the subphrenic space on the right or left side, where it can be detected by the roentgen ray.

"In the positive cases, that is, when the tubes are patent, the oxygen will be seen as a clear space below the diaphragm, most often on both sides, but occasionally on one side only. The space varies between one-quarter to one inch in depth. The diaphragm appears as a transverse septum above the dense liver shadow on the right side and over the pale stomach margin on the left. It is unmistakable, and is readily seen when the patient breathes deeply. In all our cases in which we have made roentgenograms the finding was always confirmatory. Stout patients require a somewhat greater amount to allow for the density of the abdominal wall.

"The whole examination is complete within five minutes. When the minimum volume of oxygen has been used, that is, from 100 to 150 c.c., the symptoms are negligible. There is the slightest discomfort around the diaphragm, and slight sticking pains referred to one or both shoulders. The patient dresses herself and is able to go home with comfort, and performs her duties as though she had had a simple cystoscopy. When, however, more gas has been used, the symptoms may be somewhat annoying. In such cases, it is well for the patient to lie down for a few hours on reaching home, with the foot of the bed elevated (moderate Trendelenburg posture).

"In the negative cases, that is, when the tubes are occluded, no artificial pneumoperitoneum results."

No Infallible Test of Sterility.—Cessation of menstruation is not to be considered an infallible test of sterility. Ovarian tissue may not be active enough to furnish sufficient "hormone" to institute a complete menstrual cycle, yet this tissue may ovulate and provide a corpus luteum.

TREATMENT OF STERILITY

In taking up the subject of treatment of sterility, we approach what is probably the most difficult phase of the question. Clinical observation and operative experience have taught us more in this respect than have all the laboratory investigations and experiments thus far made. The very wealth of material which these investigators have accumulated is a worthy monument to the cause, and a sufficient proof of its importance. As so little is actually known regarding ovulation and fecundation, the paucity of our knowledge regarding sterility and its treatment is hardly to be wondered at. Thus to a great extent any rules for treatment must be laid down on more or less empirical lines.

In beginning a consideration of the treatment of any disease to-day, it is customary to preface one's remarks with a more or less extended consideration of the various measures by which the disease can be prevented. Only in a very limited sense can this rule be applied to sterility. Education is the line along which the most valuable results in prevention will be achieved. As the child reaches puberty he or she should be taught in a simple and interesting manner the wonders of reproduction and its proper relation to the growth of the world. Later, a more general idea of the sex relations should be

imparted, and with young people the nature and dangers of the venereal diseases clearly and strongly dwelt upon. The work of early education in sex hygiene ought to be begun by the parents, but it is an obligation which few of them meet, and the child, in the majority of cases, takes its first lessons, and only too often all succeeding ones, from play-fellows. I know from experience that the rôle of teacher in sex matters to one's own children is a difficult one, especially with boys, but it is a duty that should not be evaded.

For many good reasons, which it would be superfluous to mention here, early marriages should receive every encouragement. One of the saddest features of society to-day is the increasing tendency to defer marriage until middle age, and there can be little doubt that this has much to do with out alarmingly high rate of sterility and diminished fertility. There has been of late a wholesale commercialization of nearly everything, and to this movement marriage is, I fear, no exception.

Hygienic Measures.—A lack of proper balance in diet and gross overfeeding increase sterility. A fact often commented upon by sojourners among primitive races is the enormous stoutness prevalent among the wives of the tribal chief, and they have commented upon this fact as a curious manifestation of his idea of feminine beauty, but the real reason underlying this is that even primitive man has recognized the fact that an abnormal accumulation of fat is conducive to a low rate of fertility, and he thus fattens his wives in order to keep down the number of his children.

The cooling and evaporating powers of outdoor air are intimately concerned with health, and the cool, fresh, morning air is a natural stimulus to activity, clear thinking, deep breathing, and an active circulation. Early rising is of great value to the individual and is worthy of every encouragement. The outdoor worker has many advantages denied the indoor worker with his sedentary habits of life. Overfeeding, laziness, and luxury are strong incentives to sex immorality and become important causative factors in sterility.

To briefly sum up the question of the prevention of sterility, let me repeat that youth, good health, plenty of outdoor exercise, and a simple life are all favorable to fecundity; while luxury and great wealth, with all their attendant evils, go hand in hand with sterility.

Leaving this realm of more or less speculation and theory, as interesting as it is, we can now pass on, I feel, with more advantage, to the practical one of the curative treatment of those conditions most

commonly associated with sterility or a lessened fertility. These will be taken up in separate chapters by themselves, and dealt with in a purely clinical manner. I shall make no attempt to prove my contentions by citing statistics, as limits of space and the desire to make this book readable have led to their omission, but shall rely upon selected case histories to bear me out. As these are but tedious reading at the best they will be used in moderation and made as brief as will serve the purpose.

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GONORRHEA AND SYPHILIS

While opinion may vary greatly as to the prevalence of gonorrhea and syphilis, there can be little doubt of the importance of their bearing on the question of sterility and fertility.

Gonorrhea.—Gonorrhea, in marked contrast to syphilis, is rarely, if ever, a cause of antenatal death or disease, but it is the most common cause of sterility.

Professional prostitution is the most frequent source of venereal infection, and one infected prostitute can give the disease to many men in a single day, they, in turn, acting as infecting agents, often in their own families. Prostitution not only spreads venereal disease but strikes at the very root of the family life. It supplies an easy and cheap means of gratifying the sex appetite of the male and affords an escape from the continuous use of contraceptives, which in time becomes intolerable alike to both parties. Clandestine prostitution is a very active factor in the spread of venereal disease, and is practiced by women who receive no money but indulge in the pleasure solely as a distraction, or as a means of showing their affection.

Of the venereal infections considered from the viewpoint of an etiological factor in the causation of sterility, gonorrhea is the most important. This disease is of great antiquity, and accurate descriptions of it are found in old writings as early as 1471 B. C. While distinctly a disease of illicit intercourse, it is frequently acquired innocently by the unsuspecting wife, and marital infections enter largely into the subject of female sterility. Many of the infections of this class are contracted on the bridal night, and it goes without saying that no man should be allowed to marry without a certificate of health from a reliable source. Examination by a specialist and the issuing of such a certificate might well be one of the duties of the marriage

license bureau. Noeggerath, years ago, remarked on the frequency with which sterility follows gonorrheal infection.

Coextensive with civilization it reaches its greatest development in large cities, while rural communities and primitive peoples enjoy a comparative immunity. No race is entirely free from its curse, none have ever been able to eradicate or to even regulate it. In large commercial centers sexual commerce becomes rife, and gonorrhea breeds apace, an inevitable result of certain phases in social life that no nation has ever yet been strong enough to control. Forced as we are to admit its ever presence, taught by experience the futility of trying to abolish it, we can but aim at its prevention and adopt measures to minimize its attendant dangers.

The specific cause of gonorrhea was discovered by Neisser in 1879, who held this disease to be, with the single exception of measles, the most widespread of all diseases. The infecting agent is a microorganism or, to speak more correctly, a group of micro-organisms, that occur in pairs or groups of four or eight. When the case is an acute one, these are easily identified under the microscope if properly stained, but in chronic cases, their demonstration may be extremely difficult, and repeated tests have to be made to exclude the disease. A valuable diagnostic aid is the complement-fixation test, which depends upon the fixation of a complement by a specific antigen (gonococci) and a specific antibody (in the patient's blood), with a resulting inhibition of hæmolysis or positive reaction. The positive reaction is rarely obtained until the third or fourth week of the disease, and persists for seven or eight weeks. If only the urethra is involved, there may be no reaction. A positive reaction may be considered as evidence of the presence of the disease, but a negative one does not necessarily exclude it. When a complement-fixation test is at first positive and later negative, it becomes of great value in deciding whether or not a cure has been effected.

Norris has said that "gonorrhea is the most potent factor in the production of involuntary race suicide, and by sterilization and abortion does more to depopulate the country than does any other cause." It is hardly an exaggeration to say that they are accountable for more cases of sterility than are all other diseases put together. I believe that no matter how high we estimate the proportion of sterile marriages due to these diseases, especially gonorrhea, we will yet fall far short of the truth.

Where or when these diseases first originated matters but little, for

they are now widespread in every civilized clime, as the elder Keyes so eloquently said: "They are found in the palace of the mighty, in the hovel of the slave; they infect the infant before its first breath, and attend the gray hairs of age, tottering to the tomb." Picture to yourself a woman of good physical health and of bounding vitality, the result of a happy hygienic and moral life, who, because her husband has infected her with gonorrhea, is, within a short time after her marriage, forced to undergo an operation necessary to save her life, or to save her from years of chronic invalidism, and after which, even if she entirely recovers, she will be doomed to a childless life for the rest of her days. When you see such a one watching a neighbor's children at play, with the light of yearning in her eyes that can never be satisfied, deprived forever of the priceless boon of maternity, can she be blamed for thinking that life has cheated her?

When the gonococcus starts on its invasion of the female, it begins the attack on her genital tract as a surface inflammation, later involving the deeper-lying tissues, and this usually by direct continuity. It may be inactive for a considerable length of time, only to take on a new life when properly stimulated. The gonococci are quick to invade gland tissue and periglandular inflammation is of common occurrence. In the glands they often persist for a long time after the surface infection has yielded to treatment, so that this feature becomes of considerable importance in relation to prognosis.

The most pointed characteristic of the disease is its chronicity, and it is from this standpoint that it naturally becomes of particular importance in sterility. Infections of the vulva, urethra, and vagina yield readily to treatment, and here the disease leaves behind it no barrier to subsequent conception, but with invasion of the cervix, body of the uterus or adnexa, the story is quite a different one, and sterility is the rule rather than the exception when these structures have gone through a marked attack of gonorrhea. Infection of Bartholin's and Skene's glands may be likewise a factor in sterility by causing dyspareunia.

The glands of Bartholin, or, as they are frequently called, the vulvo-vaginal glands, are two in number and are situated at the introitus between the anterior and posterior layers of the triangular ligament, or at times just behind the latter. They are of a compound tubular type, and under the stimulation of sexual excitement secrete a thin, translucent fluid which gains access to the vaginal entrance through ducts opening just outside the hymen or its remains.

In gonorrheal infection of the cervix, we have an extremely fre-

quent condition to deal with, and one of far-reaching importance in
sterility. Its frequency has been estimated as high as eighty to ninety
per cent in all chronic cases. A marked tendency of the infection is to
remain localized in the mucosa of the cervical canal, producing an
endocervicitis with swelling of the mucosa, and a hypersecretion of
the cervical glands. This cervical leukorrhea incident to the inflamma-
tion blocks the cervical canal, impeding or prevent the passage of the
spermatozoa. There is always a certain amount of permanent thicken-
ing of the cervix in cases of chronic inflammation. When extension of
the disease from the cervix to the endometrium or body of the uterus
takes place, it is usually at a menstrual period or shortly postpartum.
But such extension is rare, and where it does occur spontaneous resolu-
tion generally follows. In gonorrheal infection of the uterus itself,
the disease process spreads to the underlying metrium, the uterus is
enlarged and soft, depending on the severity of the infection, and its
walls are friable and easily torn.

Gonorrheal infection of the tubes is almost without exception
bilateral, although the involvement of both sides may not be simul-
taneous nor reach the same stage of the disease at the same time. It
is quite common to find one tube developing symptoms some days or
even weeks in advance of the other. As the infection invades the
tubes, congestion and edema become marked and rapidly spread to
all the layers of the tube. Gradually the infection creeps along the
tube, and as the distal end is reached, the fimbriæ draw into the lumen
of the tube approximating the peritoneal surface, which is then agglu-
tinated by the existing inflammation. In this fashion Nature seals off the
tubes and keeps the disease localized in them so as to prevent a wide-
spread general infection of the peritoneal cavity. In this she is usually
successful, but only at the expense of the woman's fertility, for with the
sealing off of the tubes comes absolute sterility; the life of the woman
has been saved, but her power to conceive is lost forever, unless it can
be subsequently restored by operation. Tubal occlusion is, in the
overwhelming majority of cases, caused by gonorrhea. The disease,
when it has thus become localized in the tube, may undergo a gradual
resolution with relief of symptoms, or go on to abscess formation,
plunging the woman into a state of chronic invalidism from which only
a serious surgical operation can rescue her.

From a tubal infection the disease may spread to the ovaries by
direct invasion and produce a peri-oöphoritis, resulting in enveloping
adhesions with more or less thickening of the capsule of the ovary

itself. This thickening of the capsule leads to the formation of retention cysts of the follicles and sometimes of the corpus luteum, though at times the ovary may be found only imbedded in adhesions and not in itself diseased. When the infection gains access to the substance of the ovary it is usually through a recently ruptured follicle or corpus luteum and the infection generally then goes on to abscess formation. Coincident with this abscess formation there is a general inflammatory involvement of the entire structure of the ovary, leading in time to complete destruction of its function. Mixed infection in these cases is quite common, and the presence of a pus tube is always a menace to its adjacent ovary. The sooner it is removed the better.

Statistics of the Gonorrheal Menace.—Statistics computed from reliable sources would tend to show that gonorrhea is responsible for nearly fifty per cent of all pelvic inflammatory disease in the female, and for over twenty-five per cent of the households on which the blight of sterility has descended. Statistics in the United States show that from sixty to eighty per cent of all abdominal operations performed for the purpose of relieving pelvic disease in married women are the result of a contageous disease from which the husband was suffering at the time of marriage. Fully eighty per cent of infected males supposedly cured will show the presence of gonococci in their semen, so that cultivation of the seminal fluid affords the best guarantee that the individual is not a carrier. It is to be hoped that cultivation of this uterine secretion at the beginning of menstruation will prove of equal value in the female in latent cases.

When gonorrhea attacks the female, it becomes of increasing importance in direct proportion to the extent of its invasion. If the disease remains local in the urethra and vagina, and is cured before it has spread any farther, the woman suffers little permanent injury. When, however, the infection spreads beyond this point, her fertility, health, and even life are threatened. It is, therefore, imperative that active and efficient treatment should be begun at the very earliest possible stage of the disease. While it remains a local disease it can be best treated by local application and for this I prefer the silver preparations used as follows:

Treatment.—With the patient in the knee-chest position, the urethra is flushed with a twenty-five per cent Argyrol solution. The perineum is then retracted with a Sims speculum, the cervix grasped with a pair of tenaculum forceps and drawn

down within easy access. The cervical canal is then cleared of mucus and excess secretion by gentle sponging with cotton-tipped applicators. Silver nitrate in twenty-five per cent solution is then applied to the canal as far as the internal os, and the cervix released. The vagina is now to be treated. If this is carefully inspected, it will be seen that as a result of the knee-chest position and perineal retraction the ingress of air has widely distended the vagina, thus giving a clear view of all portions of its walls and obliterating all folds or rugæ. The entire surface of the vagina is now seen to be as smooth as the vaginal aspect of the cervix and should be quickly but thoroughly painted with a twenty-five per cent solution of silver nitrate. A cotton tampon is then introduced and the speculum removed. These treatments should be given twice a week until smears from the cervix and vagina are negative. A sanitary napkin should be worn for twelve hours, when the tampon is removed and a saline douche given.

When the disease has reached the uterus and tubes, it is beyond any treatment with the hope of preventing sterility. Tubal involvement is bilateral, and to this rule there are practically no exceptions. Absolute sterility results from occlusion of the tubes. I have only seen one case in which conception followed an undoubted double gonorrheal salpingitis:

Mrs. E., age twenty-five years; married three years. Menstruation regular since thirteen years of age, five days' duration, moderate in amount, accompanied by severe pain. She had given birth to one child by a difficult instrumental delivery and was suffering from backache, chronic constipation, pelvic drag, and dyspareunia.

Examination showed a retroflexed uterus with a large, tender, prolapsed left ovary. The uterus was replaced, drawing the ovary with it and a suitable pessary inserted. The pessary was worn for one year, during which time her symptoms cleared up and by the time the pessary was removed had entirely disappeared. She was seen at frequent intervals thereafter and at each examination the uterus was found in normal position and enlargement of the ovary had decreased to about normal proportion.

The beginning of the next year she had a marked gonorrheal infection. Repeated vaginal and cervical smears were positive. She improved rapidly under the silver nitrate treatment, but at the end of four weeks both tubes became involved and she ran a typical course of double salpingitis and pelvic peritonitis with elevation of temperature and pulse. The tubes enlarged very much in size and the left at one time suggested abscess formation.

Under palliative treatment the symptoms subsided, and the tubes gradually decreased in size and tenderness. During the following year she was repeatedly examined; the left tube being always found somewhat tender and slightly enlarged.

About the middle of this year, within eighteen months after the beginning of

the gonorrhea, she became pregnant and was delivered at term of a living child. The puerperium was uneventful.

Syphilis.—Syphilis should always receive active and persistent treatment in the interest of the woman herself, but when she conceives and becomes a potential mother, a new factor is injected into the case, and, in the interest of her unborn child, antisyphilitic treatment becomes of greatly added importance and must be actively carried out to guard against miscarriage or the birth of a syphilitic offspring. This should be begun early in the pregnancy and can only be administered through the mother. The technic of administration, I feel, belongs to the field of urology and I shall not take it up here; yet before leaving the subject I wish to strongly emphasize the fact that as syphilis often impairs the functioning of various organs without giving rise to any direct symptoms, and is thus many times overlooked, no stone should be left unturned in ruling it out, or actively treating it, in every case of pregnancy.

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CHAPTER X

VAGINISMUS AND DYSPAREUNIA

Case report of vaginismus—Operative relief of vaginismus—Extreme type of vaginismus—Dyspareunia and inflammatory disease—Kraurosis vulva—Urethral carbuncle and vaginal cysts—Case report of dyspareunia due to vaginal cyst—Treatment of dyspareunia.

Proper coitus is at times rendered impossible by a nervous spasm of the muscles of the legs and the muscles around the vaginal orifice. Such spasm is excited by the slightest approach on the part of the male, and the more he persists, the greater it becomes. This condition of vaginismus was first described by Simpson in 1860, and later by Sims and Emmet. The latter did not distinguish it from dyspareunia. The treatment of this distressing affliction can most properly be taken up under the two heads; the psychical and the physical. The psychical side is the more difficult one to deal with, and attempts to treat this phase of the condition are nearly always disappointing. Occasionally, however, when the case is not an extreme one, and the woman amenable to reason, matters may be so explained to her that she will be able to nerve herself up to the point where a successful intercourse can be accomplished. When the ice is once broken, little difficulty is, as a rule, experienced thereafter, as coitus is not painful. In such cases the therapeutic use of alcoholic beverages will often prove a valuable adjunct in helping to overcome the spasm. The following case is a typical one:

Mrs. C., age thirty-three years. Menstruation began at the age of thirteen years, lasting seven days, moderate in amount and accompanied by slight pain. She had been married eleven years and had never had a normal intercourse because of marked vaginismus. For a number of years past no attempts at coitus had been made. Shortly after consulting me, at which time I explained to her and her husband the nature of the case, advising them as to means to overcome it, several attempts at coitus took place; the third one being successful. Following this, the patient did not menstruate again and was delivered at term of a living child, 289 days after the first successful intercourse.

Operative Relief of Vaginismus.—In extreme cases of vaginismus the measures given above are of little avail, and the treatment must be taken up entirely from the physical standpoint. Surgical means are necessary to accomplish a cure. For this a general anesthetic is necessary and the vulva incised so as to enlarge the introitus and at the same time to so relax the muscles around the orifice as to make its subsequent spasmodic closure to the male impossible.

The operative technic is simple. When the introitus is not unduly small a median perineal incision of ample length is made and deep enough to thoroughly divide the attachment of the transverse perineal fibers of the levator ani muscle. This is then sutured in the opposite direction to which it is made, that is from side to side, and gives a much-enlarged vaginal opening that will not again close down as healing takes place. The separation of the muscle fibers gives ample muscular relaxation. When the introitus is over small, two lateral incisions of the vulva, one on either side, are necessary. These should likewise be sutured in the opposite direction to which they are made. The following case was an extreme type:

Mrs. H., age thirty years. Menstruation began when thirteen years old, lasting four days, moderate in amount and accompanied by severe pain. She is an extremely nervous type and has been married three and one-half years, during which time she had suffered from a very severe type of vaginismus. There had never been a satisfactory intercourse and she had never been pregnant. Her nervousness had increased very markedly of late.

Examination, made with great difficulty, showed a marked tenesmus, a small and rigid introitus, the uterus was anteflexed, the adnexa negative. At operation the introitus was enlarged by two lateral incisions which were sutured in the opposite direction from which they were made. This gave a normal-sized opening which subsequently admitted of a two-finger examination without difficulty. The first attempt at intercourse was made six weeks after the operation and was successful. She did not menstruate again and was delivered at term.

Dyspareunia and Inflammatory Diseases.—While vaginismus is a fairly frequent cause of sterility, dyspareunia is, to my mind, far too frequently held responsible for unfruitfulness, and I cannot find on my records a single case where it was the direct cause of the sterility. That pain on intercourse naturally discourages frequent attempts is quite true, but the etiological factor is often only transitory and in time disappears. A small and rigid introitus may require some time and patience to overcome, but is usually to be conquered by persistence rather than assault.

The inflammatory diseases of the genital organs are a common cause of dyspareunia, and may even render intercourse so painful that after one or two attempts, all further trial is abandoned. During the acute stages of a gonorrheal vulvitis or vaginitis, it is hardly necessary to mention that coitus would be rarely attempted, but after the acute stage had subsided a subacute inflammation often remains in adjacent tissues which persists for a long time, making intercourse extremely painful. The glands of Bartholin and of Skene are common seats of such infection.

The glands of Bartholin, or the vulvo-vaginal glands, are two in number and are situated at the introitus between the anterior and posterior layer of the triangular ligament, or at times just behind the latter. They are of the compound tubular type, and are stimulated by sexual excitement; they secrete a thin, translucent fluid which gains access to the vaginal entrance through ducts opening just outside of the hymen or its remains. This secretion acts as a lubricant during early intercourse, the glands becoming less active with advancing sexual life. The ducts may at times be involved without the infection spreading to the glands.

When infection of the glands takes place, it usually results in pus formation, and as the duct generally becomes occluded, there is no opportunity for drainage, and the resulting abscess of the gland is extremely tender and persistent. Periodical drainage may take place only to be followed by reaccumulation. Unless surgically treated the disease may exist for an indefinite period.

The proper treatment for vulvo-vaginal abscess is incision and drainage. The opening should be freely made, as much of the gland tissue as possible curetted away, and the cavity packed. At a subsequent dressing the packing is removed, the cavity wiped out with tincture of iodin and repacked. This is continued until the cavity is entirely obliterated. In some cases by a careful dissection the infected gland can be removed entire without rupture so that the wound can then be treated as a clean one and primary union secured. This is, of course, desirable whenever possible. These glands have a strongly resistant power to other infections and gonorrhea is the most usual infective agent.

Skene's glands, likewise two in number, but much smaller than those of Bartholin, lie a little posterior to and on either side of the meatus of the urethra. They are commonly spoken of as the peri-urethral glands, and are composed of small tubules running par-

allel with the urethra and opening one on either side of the meatus. Gonorrheal infection of these tissues causes a lesion very persistent and difficult to cure, but seldom so painful as to prevent intercourse unless there is an abscess formation. The treatment consists in incision and repeated applications of pure carbolic acid until the tubule is completely destroyed.

Kraurosis Vulva.—Coitus is at first painful and later impossible in the presence of kraurosis vulva, a condition of the external genitalia first described by Breisky in 1885. This disease is characterized by a shrinking of the skin of the vulva and perineum, atrophic in nature, and as a result of which the cutaneous folds become obliterated, leaving the integument smooth, dry, and with a pale shiny appearance quite typical of the disease. Due to a loss of elasticity, the tissues are brittle and tear easily on the slightest attempt to open the vagina. Intense itching and burning are often present, so that in the beginning, before the characteristic pathological changes in the tissues have appeared, it is frequently confused with pruritis. Treatment of kraurosis vulva from the point of view of the dyspareunia is of little or no avail, and extensive injuries are likely to follow from coitus and childbirth.

Urethral Caruncle and Vaginal Cysts.—A urethral caruncle can be the seat of very acute pain on attempted intercourse, and when present should be removed. Simple vaginal cysts will rarely be found to be a cause of dyspareunia and then only when inflamed or of such large size as to completely block the vagina. When either of these conditions exists, the cyst should be removed. It is probably best, as a rule, to remove all vaginal cysts of whatever size, for during delivery they are usually ruptured, or so traumatized as to break down, become infected, and even cause a general post-partum infection.

A good example of dyspareunia caused by a vaginal cyst was encountered in the following case:

Mrs. D., age, thirty years. Married five years, during which time she bore two children, the last one two years ago. After the birth of the last child a rapidly growing vaginal cyst developed, which, from its size and tenderness, had prevented intercourse.

When I examined her, the cyst filled the entire vagina and had, so far as I could determine, a high origin in the upper vaginal third. Only with considerable difficulty and much pain was it possible to pass the tumor with the finger and palpate the cervix. At operation the cyst was partially aspirated, dissected out, and removed.

During the next two years intercourse was successfully accomplished, but as contraceptive methods were employed the patient did not conceive. These were abandoned the following year and conception promptly occurred, the patient being delivered at term of a living child.

Treatment.—In the treatment of dyspareunia the cause must first be sought for and when this is located and appropriately treated, the prognosis should be good. A very small introitus needs to be thoroughly stretched under general anesthesia, and when this is not sufficient episiotomy is indicated. Any fissure, ulcer, or abrasion around the vaginal opening, or in the vagina, should be healed before coitus is again attempted.

Lesions of the internal pelvic organs are most liable to act as a cause of dyspareunia. Displacements of the uterus, adhesions of the uterus restricting its normal mobility, adnexal disease, prolapse of the ovary, all give rise to more or less painful intercourse. The appropriate treatment is that of the responsible lesion and is usually operative, although a nonadherent uterus with prolapsed, tender ovaries can often be replaced and held in place by a pessary and thus cure the symptoms without operation. A large, painful prolapsed ovary lying in the cul-de-sac of Douglas, without any accompanying displacement of the uterus, is not infrequently found to be a cause of dyspareunia and calls for surgical care.

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CHAPTER XI

PINHOLE OS

Not always a cause of sterility—Frequently blocked by mucus—Case report.

A very small or minute opening of the cervical canal does not by any means cause sterility. The idea so long advanced and so persistently clung to by some illogical minds that a small os, even the smallest of which is of macroscopical size and easily seen by the naked eye, does not allow the passage of the spermatozoa, which are microscopical organisms, invisible to the naked eye, is an absurdity that hardly needs any discussion. The spermatozoa have many times made their way unassisted from the external genitalia through a minute opening in an unruptured hymen, traversed the length of the vagina, finally gained access to the uterine cavity through a pinhole os, and pregnancy has resulted.

The term "pin-hole os" is employed in those cases where the diameter of the external os is much less than normal. However small, it is yet always greater than the diameter of any pin. Even the most minute os is many times larger than the opening in the fallopian tube at its uterine end, through which the spermatozoa readily pass in their search for the ova. It is quite true that the smaller the cervical opening the easier it is for it to become blocked by pathological secretions from the cervical glands, and thus it is that a "pin-hole os tightly plugged with mucus" may become a cause of sterility. A case in point follows:

Mrs. S., age thirty-two years, seven years married. Menstruation began at the age of twelve, was regular, lasting six days, scanty in amount, accompanied by severe pain. For the past year menstruation has been painful. She has never been pregnant and contraceptives have never been employed.

Examination showed a small, so-called pin-hole os, tightly plugged with thick, tenacious mucus. The uterus was normal in size, position, and mobility. The adnexa were negative. The husband's semen was normal. At operation the

external os was enlarged by two lateral incisions and sewed up in the opposite direction from which they were made.

Three months after the operation, examination showed an os of normal size and free from mucus plugging. Coitus was then resumed, and the patient menstruated only once thereafter, being delivered at term of a living child only a little more than one year after the operation.

CHAPTER XII

CHRONIC CERVICITIS

Case reports—Treatment, medical—Operative relief—Congenital erosion of the cervix.

This, in the majority of cases, is a low-grade inflammation which may be confined to the cervical mucosa alone, or, as is more often the case, extends deeply into the tissues of the cervix itself. While endocervicitis is a very common gynecological condition, I cannot subscribe to the opinion advanced by many that eighty-five per cent of all women are thus affected, or that it is responsible for every female complaint from leukorrhea to pus tubes. My experience has taught me that it only becomes an etiological factor in sterility when of a sufficient degree to result in a continuous blocking of the cervical canal by the pathological secretion of mucus from the cervical glands. The gonococcus, the staphylococcus, the streptococcus, and rarely, the colon bacillus, are the infecting organisms.

In chronic inflammation of the cervix, the cervical glands are in a state of overactivity, and their pathological secretions are poured out into the cervical canal in such quantity as to prevent the passage or even entrance of the spermatozoa. This barrier may be sufficient to resist all onslaught, even of the strongest spermatozoa, or only to repel the weaker and less persistent ones. Reynolds has most painstakingly shown that only the most vigorous spermatozoa seem able to penetrate even a slight mucus barrier, either bunting themselves to death against the obstruction or after penetrating it but a short distance become enmeshed much as does a fish in a gill net, and there destroy their vitality in ineffectual efforts at further progress. If the cervical canal can be kept free of this mucus plug for a sufficient length of time to allow of connection before it refills, the spermatozoa may attain their end and conception result. The following case is fairly typical of what I mean:

Mrs. S., twenty-six years of age, had been married four years, and although extremely anxious for children, had never been pregnant. Menstruation was normal and there was no evidence of any adnexal disease. The uterus was normal in size, position, and mobility. She had always suffered from a profuse, cervical leukorrhea which had never been treated.

On examination within one hour after intercourse, normal, active spermatozoa were present in the vagina in plenty. The cervical canal was found tightly plugged by an accumulation of thick, stringy mucus. When the enlarged cervix was forcibly compressed between the blades of a bivalve speculum, fully a dram of thick mucus exuded. Subsequently under a light anesthetic, the cervix was slowly but thoroughly dilated and freed of all accumulated mucus. Conception occurred before the time for the next menstruation, and she was delivered at term of a living child.
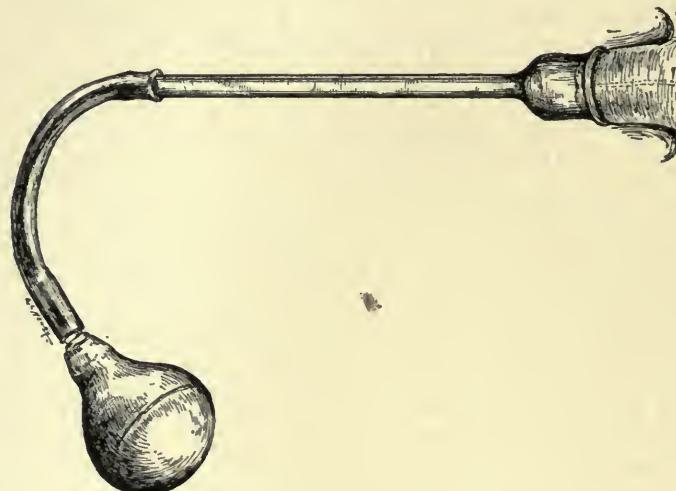
FIG. 13.—BIER CUP IN PLACE OVER CERVIX.

Treatment, Medical.—When the cervicitis is not active enough to quickly refill the canal with mucus, the line of treatment carried out in the above case will usually suffice. Often, however, the cervical glands are so active that the mucus plug speedily reforms, and in these the cervical inflammation has to be treated for some time before the canal can be kept free of mucus long enough for conception to take place. The best method of treatment is active hyperemia secured by means of the Bier cup applied over the cervix for a ten-minute period three times a week. Very often this causes a complete disappearance of the mucus plug in a few months with a subsidence of all the symptoms due to the cervicitis, even the sterility, as shown in the following case:

Mrs. T. B., thirty-seven years of age. Menstruation regular. She had been married fourteen years, during which time she had given birth to two children by

normal labors; the last one was born eleven years ago. Since then two pregnancies were interrupted at six and eight weeks, the last, five years before I saw her. From this last abortion she had developed a profuse and persistent cervical leukorrhea which had been treated at various times but without relief.

On examination the cervix was seen to be large and its canal tightly blocked with a thick, opalescent plug of mucus. The uterus was normal in size, position, and mobility, and the adnexa negative. The cervical condition was treated by artificial hyperemia by means of the Bier cup twice a week for two months. The excessive amount of mucus present at first rapidly decreased under this treatment and was replaced by the normal, glairy, cervical secretion. One month after the last treatment she conceived and was delivered at term of a living child.

Operative Relief.—When the infection of the cervix is too extensive to yield to the measures above, as is often the case where gonorrhea is the etiological factor, resort must be had to operative measures, and the infected cervical tissue with its glands reamed out. Even amputation of the cervix may be necessary in extreme cases.

Congenital erosion of the cervix, though of uncommon occurrence, is usually accompanied by sterility. Here the profuse cervical leukorrhea which is nearly always present keeps the canal permanently blocked.

CHAPTER XIII

LACERATION OF THE CERVIX

Case report—Conditional sterility—Gravity theory—Case reports—Relative sterility and habitual abortion.

When there has been a solution in continuity of the cervix at all extensive, marked pathological changes in the cervical tissues arise unless a primary repair is performed. These changes may be the result of either infection or chronic venous stasis and affect the fertility of the woman in a number of different ways. Bilateral tears cause a turning out of the cervical lips (ectropion), and this everted surface of the cervical portion of the endometrium then lies in the vagina instead of in the cervical canal. Here the continuous irritant action of the vaginal secretion, which is foreign to it, keeps the tissues in a constant state of irritative inflammation. The result of chronic cervicitis, from whatever cause, is a tendency to permanently obstruct the cervical canal by the excessive secretion poured out by the cervical glands. In cases of ectropion the cervix should be restored to its normal relations with the vagina by means of a bilateral repair. For the extensively infected cervix, amputation is the best treatment.

Mrs. W. L. R., thirty-eight years of age, married five years. Menstruation began at twelve years, always regular, lasting seven days, moderate in amount and painless. Conception had occurred promptly after marriage, resulting in a normal delivery at term. After this she had two abortions in the early months of pregnancy. With the last one the interruption had occurred at three months, two years before she came under my care. With this abortion the cervix had been badly lacerated and was not repaired. From this time on she suffered from a profuse leukorrhea, and did not again conceive.

Examination showed a lacerated and greatly enlarged cervix; the canal being tightly plugged with mucus. The uterus was normal in size, position, and mobility, and the adnexa showed no evidence of disease. At operation the cervix was repaired, within the first three months thereafter conception occurred and was followed by normal delivery at term of a living child. Another similar case was:

Mrs. R. P., thirty-one years old. Menstruation began at twelve, always regular, lasting eleven days, profuse in amount and with severe pain. She had been mar-

ried for six years and was delivered of her only child three years ago. Since then there had been no further pregnancies and she suffered constantly from back-aches, pelvic drag, menorrhagia, and dysmenorrhea.

Examination showed a large bilateral lacerated and eroded cervix with a pro-fuse cervical leukorrhea plugging the canal. The uterus was enlarged and retro-flexed but not adherent. The adnexa were negative. At operation on August 4, 1920, in St. Bartholomew's Hospital, the uterus was curetted and the cervix repaired, after which the uterus was replaced manually and a pessary inserted. This treat-ment resulted in a cure of all her symptoms; she conceived three months later and was delivered at term of a living child.

Conditional Sterility.—From a purely mechanical point of view, laceration of the cervix is far oftener a cause of conditional sterility than is commonly taught.

Herman, of London, after special study of this subject, re-ported three cases in 1902, where a repair of the cervix was promptly followed by the birth of a living child. All three patients had been subject to repeated abortions without other assignable cause before the repair was performed. He said, "Seeing that the cervical canal is kept closed during pregnancy by the firm con-traction of its muscular fibers, so that the uterine contents are not expelled, although the uterus is contracting continually through-out pregnancy, and that the first step in the process of labor is the inhibition of these muscular fibers, it seems to be reasonable to suppose that weakening of the cervix by extensive laceration might lead to premature expulsion of the contents of the uterus; and that if, in such a case, the cervix uteri were strengthened by repair of the laceration, possibly abortion might be prevented."

His operations were performed upon healthy women who com-plained of nothing except that they had repeatedly failed to carry their children to full term, and in whom the only cause discover-able for the repeated abortions was a laceration of the cervix. It can be granted then that the cervical canal is kept closed during pregnancy by the tonic contraction of its muscular fibers, and whatever interferes with the proper maintenance of this closure predisposes to an interruption of the pregnancy. I am of the opinion that this early interference is often favored by gravity, where the unsupported ovum drags upon its uterine attachment until sufficient separation occurs to cause its death and final expul-sion, and that the continual contractions normally occurring in pregnancy are not to be considered as the sole cause.

Cervical lacerations associated with marked chronic cervicitis may prevent conception, as has been previously pointed out, but

when conception in such cases occurs there is nothing in the mere presence of the lacerations to prevent the pregnancy going on to a favorable termination, with one exception, and this is when the laceration extends completely through the internal os. The uterine cavity is then left with a widely dilated opening below, through which the growing ovum prolapses by gravity. Especially is this true in the more active class of patients who are much on their feet. As the ovum enlarges it lacks the support of the closed internal os below and gradually sinks into the cervical canal. From now on, if the external os is not closed sufficiently to hold it back, it presents at the vagina, into which it gradually descends. This downward progress of the ovum tugs at its attachment in the uterine cavity above and gradually loosens it, eventually resulting in a complete detachment. Occasionally when the external os is sufficiently closed to prevent this, the ovum becomes attached to the cervical canal, resulting in a partial or complete cervical pregnancy. In such cases abortion generally results, although a few cases of cervical pregnancy have been recorded that went to term.

One of the first cases which I had an opportunity to carefully observe seems to me to present strong evidence in favor of the gravity theory and I therefore give the history in detail:

Mrs. J. D. was twenty-six years of age and had been married two years, during which time she had given birth to two children. The last labor was a difficult instrumental delivery, at which time she sustained an extensive cervical tear.

Examination showed a three-months pregnant uterus in normal position with an absence of any adnexal involvement. The cervix was large and soft with an extensive laceration on the left side extending through the internal os, so that the examining finger could readily feel a considerable area of the bulging ovum. There had already been several slight hemorrhages, and when seen she was flowing quite freely. For two days she was kept in bed and not allowed on her feet at any time. She was then allowed the freedom of her room. Two weeks later there was a return of the bleeding, only not so profuse.

Examination at this time showed that the uterus had continued to enlarge, but the ovum was found protruding through the cervix, reaching about two inches down into the vagina. She was again placed in bed, when the bleeding stopped as before, and in two days a reexamination showed that the ovum had retracted back into the uterine cavity. Several days later, believing herself free from any further danger, she disregarded my advice and indulged in a prolonged shopping tour downtown. On her way home she began to bleed freely, and an examination made shortly after she reached home showed a large proportion of the ovum extruded from the cervix into the vagina. That evening she expelled the gestation with intact membranes. The cervical tear was subsequently repaired and she carried the next pregnancy uneventfully to term and was delivered of a living child.

Another case of the same nature was:

Mrs. E. S., thirty-six years of age, during her married life had given birth to eight children; the last one a large postmature child delivered with forceps. At this time she sustained an extensive anterior laceration of the cervix through the internal os and a complete perineal laceration as well. Following this delivery there had been two abortions at three months for no known reason, and each one was preceded by a prolonged period of bleeding. No examination during these pregnancies had been made, but I feel certain from the history that their causation was the same as in the case of Mrs. J. D. above mentioned. The cervix and perineum were repaired, and the next pregnancy was carried to a successful issue.

Relative Sterility and Habitual Abortion.—Complete laceration of the cervix will be found to be a more or less frequent cause of relative sterility, responsible for a certain number of cases of habitual abortion. The proper treatment is, of course, the radical repair of the cervix, as carried out in the cases above cited.

Herman does not state the periods at which the abortions occurred in his cases, but in mine they were all early, during the first four months, at a time when contractions of the uterus are not as frequent as in the later months. We find in many cases of pregnancy that during the later months, both the external and internal os are wide open, so that one finger, and sometimes two, can easily be passed through the cervical canal into the uterus, yet they go on to term, but in the early months of pregnancy such a condition, in my experience, invariably terminates in abortion if the patient is not kept off her feet until the placenta is formed and firmly attached.

If, as Herman says, "it is reasonable to suppose that weakening of the cervix by extensive laceration tends to a premature expulsion of the contents of the uterus," then it seems to be highly probable that complete laceration of the cervix through the internal os, which leaves an open-doored uterus, can well be a frequent cause of habitual abortion in the early months of pregnancy.

This condition may be easily overlooked when the tear in the external os has united or has been previously repaired. Where complete laceration is suspected, the cervix should be dilated sufficiently to disclose the condition of the internal os. It is not sufficient to repair alone the lower vaginal portion of the cervix, but care must be taken to bring accurately together the upper uterine portion as well, so as to restore the integrity of the internal os.

I believe that laceration through the internal os probably inter-
rupts almost as many pregnancies as laceration of the external os
prevents.   If pregnancy is already present when the patient is
first seen, it may be possible to carry her safely beyond the danger
point by postural treatment.   This danger point is passed as a rule
when the placenta becomes firmly attached or about the fourth
month, but all danger may not be over until the fetus has turned
and presents by the vertex, the head then acting as a ball-valve,
keeping the uterine cavity closed.

The treatment, as already stated, consists in keeping the
patient in bed until all danger has passed.   Much can often be
accomplished in this way, as the horizontal position causes the
ovum to retract into the uterine cavity, relieving the pull on its
attachment, and further separation is thus prevented.   If the
symptoms of threatened abortion return when she again gets out
of bed, the same treatment should be repeated and persisted in
for a longer period.

Few patients, however, will appreciate the true condition of
affairs or agree to such a prolonged rest in bed unless extremely
anxious for a child.   It most of these cases of complete laceration
a correct diagnosis has never been made, and syphilis is usually
advanced as the cause of the repeated abortions.   In my experi-
ence, habitual abortion in the early months of pregnancy is seldom
of syphilitic origin.

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CHAPTER XIV

ANTEFLEXION OF THE UTERUS

Mutilating operations of no value—Intrauterine stems a pernicious practice—Proper development of uterus—Examination and treatment under anesthesia—Cervical stenosis and faulty surgery.

Under this heading are generally included the various degrees of anteflexion, from the very small, infantile type of uterus up to the anteflexed uterus of normal size, but these varying types have a vastly different bearing on the question of sterility. For many years we failed to appreciate the true significance of anteflexion, considering it as a displacement of the uterus. In the light of our present knowledge it should be looked upon rather as an error in development, or possibly better a condition of arrested development. The anteflexed uterus in the grown woman is a persistence of the infantile type of organ, in other words, a uterus that has never reached maturity. Such a uterus we find very frequently associated with sterility, it is true, but the sterility is not due, as is so often taught, to the angle of flexion which exists between the cervical canal and the uterine cavity in this type of uterus. In all probability it is a result of the immaturity of the organ, undeveloped and therefore unfitted to take on the burden of maternity. When pregnancy occurs for the first time in such a uterus, early abortion very often results. The small, immature organ is unable to keep pace with the growing fruit which it contains, and interruption occurs usually at some period between the sixth week and the third month. In these cases, it will often be found that as a result of this miniature labor, the uterus has taken on a considerable development, and it is not at all unusual for subsequent examinations to show that the previously undeveloped uterus has grown to the dignity of adult size, even though the angle of flexion may, and often does, remain. In fact, the angle of flexion frequently persists through the entire life of the uterus, and such anteflexion is often encountered in women who had borne many

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children. The added development which the immature uterus acquires as a result of this miniature labor is usually sufficient to enable it to carry the second pregnancy to term. While the infantile uterus is usually a sterile type, the anteflexed uterus is not necessarily so.

Mutilating Operations.—The many mutilating operations with which the anteflexed uterus has been attacked is a sad chapter in surgical gynecology, and much mischief has likewise resulted from the use of the so-called intra-uterine stems. Were it not for the recent revival of this pernicious method of treatment the subject might be dismissed without further comment; but so much malpractice has been perpetrated by this contrivance in the hands of those apparently ignorant of the first principles of gynecological pathology that I trust some good may be done by quoting the views held by Emmet on this subject. More than thirty-five years age he wrote as follows:

"Unfortunately, members of the profession are frequently advocating the use of the stem pessary, regardless of the experience of those who have gone before them, until they, in turn, learn that they have not been wiser in their day. As soon as the true condition comes to be appreciated, the use of the intra-uterine stem will be abandoned as a most irrational instrument. Experience will at last teach every one that no permanent benefit is ever derived; and that sooner or later, in almost every case, mischief will result from the use of the instrument."

Cases bearing out the truth of what Emmet wrote so long ago are coming to our attention again, so that it is now no unusual experience to meet with the pathetic case of the young woman in whom the use of the stem pessary has resulted in an infection involving the uterus and tubes. This may have even necessitated a pan-hysterectomy. At the best she has been deprived of all hope of maternity, which was her heart's desire, and with intelligence enough to understand the situation can hardly be blamed for her feelings of bitter resentment at the way she has been maltreated.

Proper Development of Uterus.—If treatment designed to relieve the sterility in these cases is to be of avail, it must be directed toward the proper development of the uterus, and this can best be brought about by putting the organ through as close an imitation of a miniature labor as possible. This is the way

Nature cures these cases, and the closer we follow her lead the greater will be our reward.

EXAMINATION AND TREATMENT UNDER ANESTHESIA.—Under a general anesthetic the cervix is slowly, carefully, but thoroughly dilated; the uterine cavity is then explored, and measurements taken of its depth from internal os to fundus for future comparison. The curette should not be used, as the undeveloped uterus is often deficient in endometrium, and when curetted will occasionally cease menstruating altogether and undergo a premature atrophy. The uterine cavity should now be tightly packed with a narrow strip of iodoform gauze, brought out through the cervix into the vagina. I say tightly
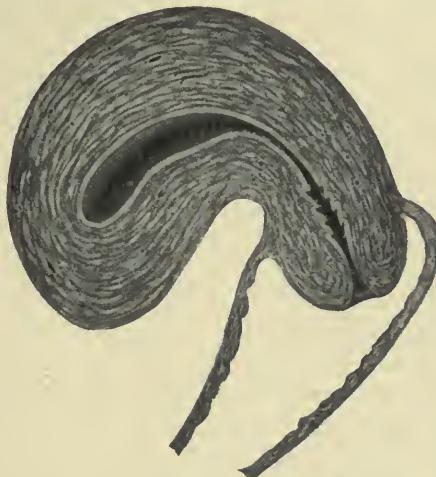
FIG. 14.—ANTEFLEXION OF THE UTERUS (PRYOR).

packed because the object of this treatment is to stimulate contractions by introducing a foreign body (the gauze) into the uterus, thus leading to a greater muscular development and a further increase in size. Iodoform gauze is best used because it will remain in the uterus and vagina the necessary length of time without becoming foul. The patient so treated should have the fluid extract of ergot administered in thirty-drop doses every three hours during the first three days after operation, until severe uterine contractions are noted, or the physiological tolerance of the drug reached. On the fourth day the gauze packing is removed. At this time, in those patients who have had severe uterine colic attending the treatment, it is not unusual to find that the bulk of the uterine packing has been expelled into the vagina. Time and again I have found this to be the case. Many of these

patients complain very bitterly of the severe pain accompanying this treatment, and those who have always suffered from severe dysmenorrhea often say that the pain is in excess of any they ever had with their menstruation, so that this should be explained to them in advance as being a part of their treatment. Morphine or codein can be given if the pain becomes unbearable. When this treatment has been carried out once or twice, careful measurement of the uterine cavity will generally show that it is markedly increased in depth, and occasionally we are able by a bimanual examination to make out an actual increase in the size of the uterus. When dysmenorrhea has previously existed, it will usually be cured, and conception often promptly result.

CERVICAL STENOSIS AND FAULTY SURGERY.—Much of the surgery that has been done in cases of cervical stenosis, so called, and anteflexion of the uterus, has been of "the family doctor" variety. It is a habit with many general practitioners to advise "a little stretching and scraping" to every would-be mother that consults him, and many of these are brides of only a few months, his idea being that the spermatozoa cannot enter a small cervical canal or turn the corner of an angle of flexion. He shows entirely too little respect for Nature and sadly underestimates the ability of this clever organism. The frequency with which, even to-day, cervical dilitation and the correction of an anteflexion are advised as a cure for sterility is a sad reflection on our teaching.

That the angle of flexion is in itself a barrier to conception is not true; and it is encouraging to see that this erroneous opinion is advanced less frequently now than was the case fifteen or twenty years ago. Special study by an ever-increasing number of competent observers has brought into the light of day many facts that were hitherto shrouded by darkness in the night time of gynecological investigation. Difficulty in defining the symptoms has also been greatly lessened since anteflexion has been ruled out of the category of displacements and become properly recognized as an error in development.

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CHAPTER XV

RETRODISPLACEMENTS OF THE UTERUS

Anatomy of the uterus and adnexa—Ligamentous attachments of uterus—Mechanism of displacements—Pelvic diaphragm—Gravity and position of the uterus—Arrested uterine development — Classification of retrodisplacements — Case reports—Habitual abortion due to congenital retrodisplacements of uterus—Case reports—Postpartum retrodisplacements—Case reports—Operative correction of retrodisplacements—Treatment of retrodisplacements—The use of the pessary.

There has existed in the past, and still exists, such a wide difference of opinion regarding the part played by retrodisplacements of the uterus in sterility and fertility that any work dealing with the subject would be woefully lacking without some attempt being made to reconcile these conflicting opinions. To do this it becomes necessary to consider at some length the anatomy and physiology of this organ.

The uterus, more so probably than any other organ in the body, rests in a state of unstable equilibrium, undergoing frequent changes in position consequent upon a continually shifting center of gravity and constant physiological changes in the adjacent viscera. Being of small bulk, less than three ounces in weight, and attached to highly elastic structures within a cavity large enough to admit of considerable latitude of movement, it is not hard to realize that under unfavorable circumstances even a very slight cause may suffice to produce a displacement. In order to better understand how the normal balance is maintained, let us turn for a moment to the anatomy of the uterus and its adjacent structures.

Anatomy of the Uterus.—With the woman in the erect posture, the pelvis occupies an oblique position with regard to the trunk of the body, being at an angle of sixty to sixty-five degrees with the ground on which she stands. Within the pelvis lies the uterus, parallel, or nearly so, to the horizon. Its fundus is directed forward and rests with its face on the posterior aspect of the bladder, to which it is united by a reflection of peritoneum. Above,

the uterus does not reach the plane of the inlet, and its long axis, from the fundus to the cervix, lies in front of the axis of the pelvis, but the two are parallel and form with the long axis of the body trunk an angle varying from 70 to 100 degrees. The cervix is directed backward towards the hollow of the sacrum, perpendicular to the axis of the vagina. The external os lies at the level of the upper margin of the symphysis pubis, and in a frontal plane passing through the spinal ischiatical.

This relative position between uterus and pelvis remains pretty constant, though considerable variation, within physiological limits, may occur. For example, as the bladder fills it rises in the pelvis, carrying the fundus upward; a marked degree of
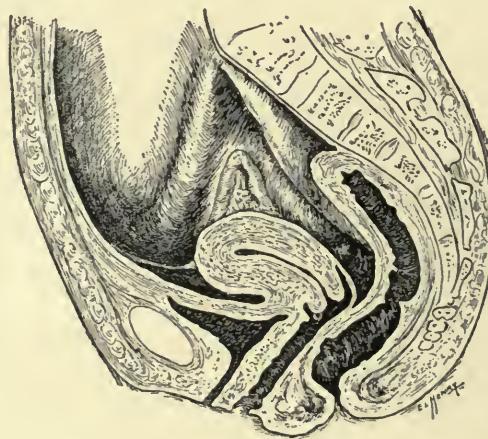
FIG. 15.—NORMAL POSITION OF UTERUS.

overdistention pushes the fundus backward and swings the cervix forward. Thus, as the fundus approximates the promontory of the sacrum, the uterine axis becomes nearly one with that of the pelvis. When the bladder empties the fundus swings forward again, while the cervix goes back, and the uterus as a whole sinks to its former position. An overdistended rectum crowds the uterus forward and may even flex the cervix upon the fundus, at times elevating the organ well out of the pelvis. As the body is bent forward, the uterus may change somewhat its position in the pelvis, which it tends to leave, approaching the abdominal cavity. In the dorsal position the uterus moves back a certain distance toward the hollow of the sacrum, though normally this occurs to only a slight degree. The highest point of the fundus does not

extend above the pelvic brim, and the normal non-pregnant uterus is always entirely within the pelvis. As the uterus is one of the most movable organs in the body, it necessarily follows that it does not always maintain a constant and unalterable position.

The fundus and cervix form with one another an obtuse angle equal to about 160 degrees, but many variations occur without constituting a sufficient departure from normal to be classed as pathological. The uterine axis is usually straighter in parous women than in those who have never borne children, though this is by no means the rule. We frequently find persisting in women who have borne a number of children a markedly anteflexed uterus. They are seldom found to suffer from dysmenorrhea, so common a symptom in nullipara with anteflexion.

Ligament Attachments of Uterus.—We come now to a consideration of the means by which this support, allowing as it does of such extensive changes in position, is accomplished. If we stop for a moment at this point and consider the other organs in the body, we find that they are all, without exception, suspended by ligaments or ligament-like structures; the lungs, the brain, the heart are all held in place in this manner. Nature's method of supporting organs is by suspension and by suspension alone, for only in this way is it possible to protect them from injury or impairment of function that would result from sudden changes in position of the body, did they occupy a fixed and immovable position. The uterus is no exception to this rule. Indeed, there is no other organ in the body comparable with it in size that has so many and so strong ligaments. Were it not for this efficient cradle-like suspension, probably few pregnancies would survive nine months of continuous jolting. In addition to the suspending ligaments there are certain supporting structures which undoubtedly exert a strong sustaining influence. Much of the cervical support is probably derived from attachment to the vagina, and to the connective tissue between it and the bladder, as well as the recto-uterine muscles running to the lateral walls of the rectum, and to the sacrum.

The principal supporting structures of the uterus I would enumerate then as: (1) The broad ligaments; (2) the uterosacral ligaments; (3) the round ligaments; (4) the transverse cervical ligament; (5) the cervicovaginal insertion with the fascial attachment to the bladder.

The two broad ligaments are reflections of peritoneum and pass from the pelvic wall and floor across the pelvis, enclosing between their layers the round ligaments, ovarian ligaments, and fallopian tubes, together with the associated blood vessels and nerves. They are analogous to the mesentery of the small intestines, serving the same purpose for the uterus and its appendages, i.e., to help hold them in position and to transmit their nutrient vessels. The superior free border represents the summit of the plication which turns around the tube and descends by a sinuous course toward the sides of the pelvis, its outer extremity lying external to the distal end of the tube, forming a sharp, strong fold, the infundibulo-pelvic ligament carrying the ovarian vessels.
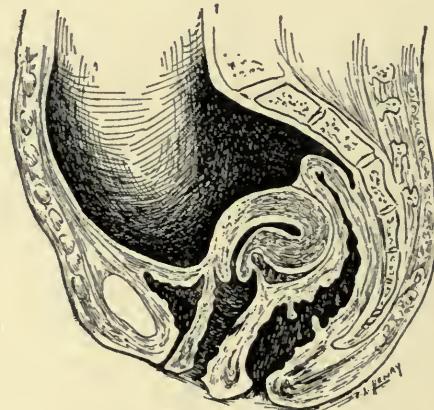
FIG. 16.—RETROFLEXION OF THE UTERUS.

The two utero-sacral ligaments are enclosed in the recto-uterine folds of the peritoneum running to the lateral walls of the rectum, and to the sacrum. This fold of peritoneum lies between the uterus in front and the rectum behind, forming the floor of the pouch of Douglas. The lateral boundaries of this pouch are the two utero-rectal folds that enclose between their layers bundles of fibrous and muscular tissue, passing from the cervix to their insertion, partly in the walls of the rectum and partly in front of the sacrum. They arise as flat, rounded cords from the posterior walls of the uterus, and contribute efficient aid to the support of its cervical segment. These ligaments are of variable thickness, well defined in some cases, and in others barely perceptible. When well developed they are of considerable value in

holding the cervix up in the hollow of the sacrum, preventing its forward and downward displacement. The two round ligaments are larger, stronger, and more consistent in their development. They consist of connective tissue and smooth muscle fiber, with some nutrient vessels and nerves, and arise from each horn of the uterus in front of and just below the tube. Their mode of origin is by a fanshaped base, narrowing down to a rounded cord as the ligament develops. It is not unusual to encounter an anomalous origin in one or both ligaments, the point of attachment being farther forward, nearer the cervix, and I have at times found them coming off as far forward as the waist of the uterus. This low attachment is an important point with relation to posterior displacements, and is an anomaly frequently found in the congenital displacements.

The round ligaments are about five inches long and one-quarter of an inch thick, and pass from their origin at the uterus forward and outward between the folds of the broad ligaments to the lateral pelvic wall. Gradually decreasing in size, they enter the internal abdominal ring, pass along the inguinal canal, and out at the external ring to be finally lost in the labia majora. The action of the round ligaments is to hold the fundus forward.

The transverse cervical ligaments consist of bands of firm, fibrous tissue which forms a distinctive part of the visceral layer of the pelvic fascia. They arise in the neighborhood of the ischial spines and, passing through the cellular tissue of the pelvis, are attached to the sides of the cervix and to the vaginal vault. Unlike the true uterine ligaments they have no special peritoneal covering. According to some anatomists, they form a part of the sheath of the uterine arteries, which reach the uterus at about the same level. The most recent investigations would seem to establish the fact that these fascial bands are of considerable importance in maintaining the position of the cervix. The cervico-vaginal insertion, together with the fascial attachment to the bladder (the utero-vesical ligaments), affords a certain amount of support to the uterus, though just how much is problematical.

That these ligaments are the sole support of the uterus is amply proved by investigation, and that the uterus derives its support in any way from underlying structures is absolutely false, notwithstanding past and even present assertions to the contrary. The old idea of perineal support probably arose from the fact that

as laceration of the perineum was so often associated with pro-
lapse of the uterus, it was taken for granted that the perineum
acted as a sort of prop under the uterus to hold it in place. Those
who formulated this theory neglected to take into consideration
the fact that it is only when the perineum is partly torn that pro-
lapse occurs, that when it is completely destroyed prolapse seldom
results. Furthermore, prolapse in nulliparous women with an
absolutely intact perineum is not unusual, and retrodisplacements
abound in this class of patients. We are therefore led inevitably
to the conclusion that the perineum is not an essential support to
the uterus.

When the perineal muscles are torn or greatly overstretched
certain new mechanical elements are introduced that may become
important factors in contributing towards a displacement.

Pelvic Diaphragm.—The pelvic diaphragm, limiting the
abdomino-pelvic cavity below, as the abdominal diaphragm limits
it above, is probably of great importance. It is also not infre-
quently lacerated during labor, the tear extending through its
anterior portion. It is a musculo-fascial structure of great elas-
ticity, composed of two layers, a deep (superior) fascial layer, and
a superficial (inferior) muscular layer. The superior layer is a
part of the visceral layer of the pelvic fascia, which arises from
the white lines, and seems to form a part of the inner wall of the
ischio-rectal fossa. The inferior layer is formed by the coccygeus
muscles. These are comparatively weak muscles, morphologically
the homologs of the strong tail-wagging muscles of the lower
vertebrates. In the human species they are not so well developed
and, as Paramore has shown, have assumed a very different func-
tion, that of enabling the pelvic floor to meet variations in intra-
abdominal pressure. These muscles are thrown into a state of
contraction during defecation, and whenever a sudden increase in
intra-abdominal pressure occurs, as in coughing, sneezing, and
during violent muscular exertion. Thus they sustain the pelvic
viscera against forces tending to drive the viscera through the
pelvic outlet. The levator ani has a long continuous line of attach-
ment to the pubic wall, from the back of the symphysis pubis in
front to the ischial spine behind, its fibers pass more or less
obliquely downwards and inwards to meet those of the opposite
side, or to become attached to the walls of the uretha and vagina,
to the median aponeurosis between the vagina and the anus, and

to the coccyx. Muscles and fascia are closely blended, the latter being, in fact, the muscles aponeurosis. The lower surface of the levator ani is covered by the thin anal fascia.

The tissues comprising the pelvic diaphragm are closely united to the urethra in its lower half, to the cervix, to the vaginal vault, and posteriorly to the rectum and sacrum.

As the levator ani is a comparatively feeble muscle with a thin fascial edge, its central portion is frequently lacerated by the advancing head in labor, resulting in a gradually developing rectocele, which by its constant drag finally pulls the cervix into the axis of the vagina, throwing the fundus back when the intra-abdominal pressure acting on the anterior wall of the fundus eventually drives the uterus farther back into a position of permanent retrodisplacement.

The principal suspensory structures of the uterus are the utero-sacral ligaments, holding the cervix up in the hollow of the sacrum, and the round ligaments holding the fundus forward. The part taken by the round ligaments is a most important one, but only at certain times are they called upon to actively enter into the support of the uterus. They are attached to the fundus, and serve to guide and limit its excursions. Pulling always forward by virtue of their attachment at the external inguinal ring, it is easily seen how they help to counteract any tendency to a retrodisplacement. Largely muscular in structure, they possess in common with other muscles the power of undergoing hypertrophy, a fact clearly established in pregnancy, where they enlarge and elongate, keeping pace with the hypertrophy of the uterus. In pregnancy they hold the fundus forward as it rises into the abdominal cavity, and after delivery, involuting hand in hand with the uterus, they pull the fundus back in safety to its anterior position in the pelvis. When for any reason the uterus reaches a low enough level in the pelvis to bring the uterine attachment of the ligaments below the pelvic attachments, the round ligaments become truly "suspensory," and strongly resist any further downward progress. Any condition that weakens or stretches the ligaments of the uterus, or increases the weight of the uterus, tends to the production of a displacement.

From a consideration of the foregoing, it will readily be seen that any attempt to define the position of the uterus must take into account its various tissue relations to the neighboring

structures. As the muscular and connective tissues of the vagina are directly continuous with the muscular and connective tissues of the uterus and of the muscular tissue and fascia of the pelvic diaphragm, it can be easily understood why these should be considered as important factors in uterine support.

The investing peritoneum of the free portion of the uterus is continuous on either side with the broad ligaments, with the bladder anteriorly, and the rectum posteriorly, but it is doubtful if this peritoneum acts in any way as a supporting factor.

To the upper segment of the cervix are attached the strongest supporting structures, to the lower segment practically none, while to the fundus are attached only the round ligaments. Thus are the body and vaginal portions left comparatively free to develop very considerable changes in position, but as the upper cervical segment remains the pivotal point, neither can undergo any marked change in position without a corresponding change of the other; when the fundus moves posteriorly, the cervix comes forward into the axis of the vagina, only to go back again to its normal position, perpendicular to the vaginal axis, when the fundus once again comes forward. This upper cervical segment, though constituted by virtue of its many attachments a fixed point, so to speak, is by no means immovable, but, to the contrary, has a wide range of mobility under perfectly normal conditions.

How dependent the uterus may be on neighboring viscera for its support is problematical, but I see no reason to believe that they act other than to help to change its position within normal limits. We frequently meet with a uterus crowded into an extreme anterior position against the symphysis by a rectum overdistended with feces, and likewise a retroverted uterus held back in the hollow of the sacrum by an overdistended bladder. The uterus readily replaces as soon as the mechanical factor is removed. This rectal condition never causes a permanent displacement, but habitual overdistention of the bladder is an important etiological factor in displacements and one not so generally appreciated as it should be. Even the most casual dilettante in vaginal examination will readily diagnose a pelvis full of feces, while a bladder containing twenty or more ounces of urine may entirely escape his notice. Frequently have my students made a diagnosis of retroversion for which they advised operative correction when the passage of a catheter resulted in the immediate restoration of the uterus to

normal position.   Women are prone to neglect the function of urination, and I have often seen a temporary retrodisplacement that might have in time become permanent corrected in a few months by a more frequent emptying of the bladder.

GRAVITY AND POSITION OF UTERUS.—Gravity has much to do with the position of the uterus, and any marked increase in its normal weight must be taken into consideration.   Though of subordinate importance to the other factors mentioned, it nevertheless enters into the etiology of many retrodisplacements, particularly the postpartum ones.   As a rule the traction of the ligaments is stronger than the effect of gravity, so that the position of the uterus does not change with changes in position of the woman. But when the ligaments are lax and the uterus large, as in the postpartum state, prolonged lying in the dorsal position may easily produce a retrodisplacement.   The influence of gravity then varies directly with the weight of the uterus and the relaxation of its supporting structures.

I have purposely omitted thus far any reference to intra-abdominal pressure as an essential factor in maintaining the normal support of the uterus, because I do not believe that it enters the question except on the negative side.   That it influences the position of the uterus under certain conditions, just as do the rectum and bladder, cannot be denied.   The support of the uterus is maintained by its connection with adjacent tissues; its position only is modified by gravity, neighboring viscera, and intra-abdominal pressure.

The posterior deviations of the uterus from normal are generally known as retroversion and retroflexion.   The difference between the two is largely one of degree, and though retroflexion implies a change of form as well as position, the retroversion of the morning may be converted into a retroflexion by evening. The location of the angle of flexion is generally at the level of the internal os.   There are, besides these, two additional types important enough to justify special mention : the retroposed ante-flexion, where retroversion is combined with flexion over the anterior surface; and the anteposed retroflexion, where anteversion with flexion over the posterior surface exists.   The former of these combinations is not unusual and occurs when a rigid ante-flexion falls or is drawn by adhesions into retroversion.   The latter is of extreme rarity and follows the operative replacement of

an inflexible retroflexion, where the angle of flexion was not cor-
rected at the time of operation.

Classification.—For the purpose of classification, the retro-
displacements may be considered from several different points of
view. Those that are acquired should be separated from those
that are of congenital origin. The influence of the development
of the organ itself is essentially different in those originating dur-
ing fetal life and childhood from those acquired in later life. Also
is the treatment at times widely different. There are further dis-
placements caused by the pressure of tumors from without, and
some that result directly from trauma.

A retroflexion, even of long years' standing, does not neces-
sarily destroy the normal flexibility, but when this has been lost,
the flexion must be corrected at the same time as the displace-
ment. Displacements of the uterus are considered pathological
only when they become more or less permanent. Limitation of,
or obstruction to, normal mobility is characteristic of retrodis-
placement of the organ.

There can be little practical use in laying down any particular
angle to characterize retroversion or retroflexion, or the differ-
ence between the two. The retroverted fundus seldom becomes
permanently retroverted until it reaches the posterior pelvic wall.
After this there can be little or no doubt regarding the nature of
the displacement. Definitions of different degrees of retroversion
and retroflexion might be of some practical value in certain indi-
vidual cases, if all authorities defined these differences in the same
way. As they do not do this, it seems to me that any such
definition is useless and of purely academic interest. However,
in order to have some standard to go by, I shall assume that retro-
version of the uterus exists when the axis of the uterine body
forms an obtuse angle with the axis of the pelvic inlet; and retro-
flexion when the posterior uterine wall is bent upon itself. Both
are permanent inclinations of the fundus backward, but in retro-
flexion there is a marked change in the relations between the
fundus and the cervix, that is, a change of form as well as of posi-
tion. If the uterus be displaced posteriorly beyond its normal
range of mobility and does not spontaneously return to position,
the displacement becomes pathological. The uterus, though par-
ticularly mobile at all times, is often forced into extreme retro-
version by an overdistended bladder. It should, nevertheless,

promptly return to its normal position as soon as the distended bladder is emptied. Abnormal mobility often leads to permanent retrodisplacement, of which it is a necessary antecedent, and depends upon the general relaxation of all of the uterine supports.

It is not only interesting then, but important, to discriminate between physiological retrodisplacement and pathological retrodisplacement. As we have seen, the former is produced by certain physiological changes in the surrounding viscera; but it should be borne in mind that an extreme degree of retrodisplacement, such as retroversion, is never physiological, and whenever found is to be considered pathological.

There is a type of retrodisplacement important enough to justify special mention, and which is considered as congenital. This is more often seen in the form of flexion than of version. Being the result of a faulty development, it is usually accompanied by errors in the development in other parts of the genital tract as well. The commonest of these is a short anterior vaginal wall which has an important bearing on treatment; for until this is lengthened sufficiently to allow the cervix to swing back into the hollow of the sacrum, the fundus cannot be made to remain forward with any degree of success.

I cannot agree with those who take the stand that so long as a congenital retrodisplacement causes no symptoms, it does not call for treatment. My experience has been that symptoms always develop in this type of case sooner or later, and that by the time these manifest themselves more or less permanent changes have occurred in the uterus itself which might have been avoided had it been earlier restored to its normal position. The sooner after puberty that such a displacement is corrected, the greater is the chance of the uterus developing into a normal organ. Congenital retrodisplacement is not such a rare condition as one might be led to believe from the slight attention paid to it in the literature. Various reporters have found it present in from thirteen to twenty-five per cent of all cases of backward displacement. The congenital shortness of the vagina is often found where there is a combination of retroversion with flexion—the above-mentioned retroposed anteflexion.

An arrest in development of the uterus leads to a persistence of the infantile type, that is, extreme anteflexion. This original shortness of the anterior vaginal wall brings the small uterus

lower under the bladder, so that where habitual distention of the bladder in normal cases causes only slight retroversion, in the cases of congenital shortness of the vagina the combination of retroversion with anteflexion is met with comparatively often. It has also been observed that senile involution of the genital organs is frequently accompanied by a shortening of the vagina, which, as the capacity of the bladder remains unaltered or even increased, frequently leads to retroversion of the uterus in elderly women.

Relaxation of all the attachments of the uterus is by far the commonest of the anatomical causes leading to retroversion and retroflexion. A uterus that has been retrodisplaced, even though but for a short time, becomes at once stable again. The organ may undergo repeated returns to normal for weeks or months before it finally comes to a permanent state of retroflexion. This is the class of cases that yields such happy results to the pessary treatment. Posterior flexion of the uterus is seldom ever more acute than a right angle.

Retrodisplacements of the uterus are among the most common pathological affections of the female generative organs, and have much to do with sterility and lessened fertility, but it is next to impossible to give even approximately accurate statistics regarding their frequency and effect upon procreation.

From a perusal of the foregoing, it should be quite evident that to define just what constitutes a displacement of the uterus, of a sufficient degree to be considered abnormal, presents in many cases considerable difficulty. As a general rule displacement of the uterus need only be considered as pathological when such displacement is more or less permanent. The normal range of mobility of the uterus may be limited, or even obstructed, or its range of mobility may be very markedly increased. Such limitation or obstruction is usually due to inflammatory changes in the surrounding tissues, or to the presence of neoplasms in the uterus itself, and is decidedly permanent. Increase in the range of mobility is invariably due to overrelaxation of the normal attachments of the uterus, and thus may be only temporary. The knee-chest position, properly taken, may in time correct a displacement of this kind by relieving the tension on the overstretched supports, thus giving them a chance to regain their normal tone. It is in just this class of case that the use of the pessary helps so much to hasten the cure. When the knee-chest position or pessary treat-

ment is not persisted in long enough, the benefit will be only temporary, and the displacement of the uterus eventually becomes permanent.

We may then consider that abnormal mobility is an intermediate condition between the normal and the pathological, and should always be considered as a border-line condition, more or less pathological in itself. Thus it may be said that overrelaxation of the uterine supports, with excessive mobility of the organ itself, is a condition of considerable importance and one that is more favorable to treatment in its early stages than after it has existed for some length of time. In the early stages many a permanent cure may be accomplished by a six months' pessary treatment that at a later period would require surgical treatment for its correction. When displacement of the uterus once begins, the condition is usually progressive, going on steadily from bad to worse, so that with the general tissue relaxation of advancing years, many a first degree prolapse later develops into a complete procidentia.

For the purpose of classification the retrodisplacements may be considered from several different points of view, but all may be included in two divisions: congenital and acquired. The congenital originate either during fetal life, or in early childhood, the result of imperfect development, and are essentially different from the acquired type. These latter occur later in life and are either traumatic in origin or result from factors arising from childbearing. The congenital type is of particular importance and calls for early replacement, because the influence exerted by the continued displacement leads to permanent changes in the immature organ. In the acquired type arising later in life, at a time when the uterus has achieved its full development, permanent pathological changes are not so liable to result.

Retrodisplacement of the uterus becomes an active factor in the causation of sterility in one of two ways; either the pathological changes in the uterus resultant upon its abnormal position prevent conception or result in an interference with pregnancy when conception has occurred. Many displacements are at some time or other accompanied by inflammatory processes in the uterus itself and such chronic inflammations must be considered partly as a cause and partly as a consequence of the displacement. The pathological changes which occur in the uterus itself as a result of the displacement vary according to the length of time

the displacement has existed. The first change that takes place in every displacement is a venous stasis, or congestion. As time goes on this congestion becomes chronic, leading to permanent changes in the uterus itself. The most prominent of these is an increase in connective tissue in the uterine walls, and a thickening or overgrowth of the endometrium, known as hyperplasia or hypertrophy. In the retrodisplacements associated with subinvolution, such as are encountered in parous women, there is a general profuse overgrowth of connective tissue, replacing to a certain extent the muscular elements of the uterus. Adhesions in the pelvis are responsible at times not only for maintaining the retrodisplacement but actually interfere with its replacement. Inflammatory disease of the adnexa with extensive adhesions often hold the uterus in a position of retroversion long after the acute process has subsided. While it is quite true that the retrodisplaced uterus may become pregnant, and that the pregnancy may even correct the displacement spontaneously as the uterus enlarges, the pregnancy then going on to term, we know by experience that this is the exception rather than the rule. Ordinarily the retrodisplaced pregnant uterus begins to show evidence of distress as the end of the third month approaches, and if it is not promptly replaced, the pregnancy usually terminates in an abortion. In view of the fact that the retrodisplaced uterus is associated with a high degree of sterility and a low degree of fertility, the displacement should always be corrected, preferably before pregnancy has occurred. Many cases of habitual abortion in the early months are due to a retrodisplacement, and many of these are in women who have never borne children, in whom the displacement is of the congenital type. The following case is an example of this class:

Mrs. M. T., when first seen, was twenty-nine years of age and had been married four years without ever having given birth to a viable child. Menstruation had been regular since its onset at the age of fourteen years, of five days' duration, moderate in amount and painless. She had suffered from three abortions for no known cause. These had all occurred at a period between the second and third month.

Examination showed a rather small and extremely retroflexed uterus, with a large, tender, prolapsed right ovary. A diagnosis of relative sterility was made, and under a general anesthetic the uterus was replaced, carrying the ovary with it, and a retroflexion pessary inserted. After this treatment she menstruated the first and second months following; conception then occurred during the third month and she was delivered at term of a living child. Two years later she bore a second

living child. The retroflexion recurred after each delivery, but yielded to pessary treatment in the intervals.

Habitual Abortion Due to Congenital Retrodisplacement of Uterus.

—The majority of cases of habitual abortion associated with congenital retrodisplacement of the uterus will be found to have a short anterior vaginal wall that, while the fundus can readily be brought forward, will not allow the cervix to swing back into the hollow of the sacrum where it belongs, but keeps it forward in the axis of the vagina. This prevents the pessary from holding the uterus in normal position, even though it is possible to accomplish the replacement. In such cases the anterior vaginal wall must be lengthened in order to permit replacement of the cervix as well as of the fundus. This is accomplished by a transverse incision made at the junction of the vagina with the cervix. Through this incision it it well to free the uterovesical ligament from its attachment to the cervix and reattach it at a point high enough up, to allow the cervix to swing back into the hollow of the sacrum, perpendicular to the vaginal axis. In most of these cases this should be done as routine when lengthening out the anterior vaginal wall. The transverse incision in the anterior vaginal wall is then sutured in a longitudinal direction, by which procedure the lengthening out is accomplished. As an instance of this type the following case history is given:

Mrs. H. H., age twenty-two years, had been married two years without ever having given birth to a viable child. Menstruation, which began at twelve years of age, was always regular, lasting three days, moderate in amount and accompanied by only slight pain. She had conceived twice, both pregnancies ending in abortions before the third month, without assignable cause.

Examination showed a retroflexed uterus, with a short anterior vaginal wall, and replacement could not be effected. No other pathological lesion was made out. Through a vaginal incision the uterovesical ligament was freed and reattached at a point sufficiently high up on the uterus to allow the cervix to go back into the hollow of the sacrum. The anterior vaginal wall was then lengthened. The uterus was replaced and a suitable pessary introduced. The next conception occurred within two months, and she carried this pregnancy through to a successful issue, being delivered at term of a living child.

The displacement recurred postpartum, and for this she was treated with a pessary for four months. At the end of this time it was removed and the uterus remained in place. With the next pregnancy, it again retroflexed, but, being promptly replaced, the pregnancy went on to term without any interruption, and she was delivered of a second living child at term. Once again there was a postpartum recurrence of the displacement, which yielded as in the first instance to a few months' use of the pessary.

The above case is an excellent example of the usual inability of the congenital, retroflexed uterus to carry a pregnancy beyond the first few months and illustrates how readily the condition may be corrected by the use of the pessary. It is not often that any operative procedure other than lengthening of the anterior vaginal wall and reattachment of the uterovesical ligament will be found necessary, and even this latter may be sometimes omitted. To subject such a case to a major surgical risk for the correction of the displacement is rarely warranted.

Postpartum Retrodisplacement.—Postpartum retroflexion of the uterus may also prevent another conception or cause habitual abortion in the early months. In these cases replacement is usually the easier of accomplishment, provided adhesions are not present, and the results are equally as good. The anterior vaginal wall lengthening and ligament operation do not need to be performed.

The adherent retroflexion cases require an operative separation of the adhesions before replacement can be accomplished and in addition shortening of the ligaments to retain the uterus in place. The following cases illustrate somewhat different phases of this type:

Mrs. D. O. was forty years old and had been married three years without ever having been pregnant. Menstruation began at fourteen years of age, was always regular, lasting seven days, but accompanied by severe pain.

Examination showed a small, retroverted and adherent uterus with enlarged, prolapsed, and tender appendages on the left side. At operation, an abdominal incision was made and the uterus found adherent in extreme retroversion. Both ovaries were prolapsed and likewise adherent. The tubes were free, but short and situated high up on the broad ligaments. All adhesions were separated and the left ovary, which showed marked cystic enlargement, was resected. The round and utero-sacral ligaments were shortened to correct the retrodisplacement. Fourteen months after the operation she was delivered at term of a living child.

Considering the advanced age of the patient, the long period of sterility and its prompt relief through operation, this case is a remarkable one and a most encouraging example of the promptness with which Nature will act if only given proper assistance.

Mrs. R. H., thirty-one years of age, was married two years, during which time she had not conceived. Menstruation began at twelve years of age, regular, five days' duration, moderate in amount and accompanied by severe pain.

On examination the uterus was found to lie in retroflexion and the right ovary was enlarged, tender, prolapsed, and adherent. The husband's semen was normal. A diagnosis of conditional sterility was made. At operation the right ovary showed an enlargement of venous stasis resulting from its displacement. It was freed from adhesions and replaced with the uterus. The round and retro-sacral ligaments were shortened and the appendix removed. Eight months later

she conceived, but aborted at two months after a prolonged and painful session with her dentist. Within six months she again conceived, but, being more careful this time, carried to term and was delivered of a living child. There has been no recurrence of the retroflexion.

Mrs. J. McK., thirty-seven years of age, and eight years married. Has never been pregnant. Menstruation began at thirteen years of age, was always regular, lasting three days, moderate in amount and painless. The husband's semen was normal.

Examination showed an adherent uterus with prolapsed, adherent left adnexa. Diagnosis was conditional sterility. At operation both ovaries were found adherent to the posterior face of the broad ligament and the uterus slightly adherent to the rectum. The tubes were normal. The adhesions were separated, the uterus replaced and its round ligaments shortened. Convalescence was uneventful, though protracted, and as she was in wretched general health and had been for some time, coitus was prohibited for one year. At the end of this time she had regained excellent health and the ban on intercourse was removed. Conception took place shortly thereafter and she went through a normal pregnancy to term, only to lose her life from accidental, concealed hemorrhage due to a premature separation of the placenta.

Pregnancy after Operative Correction of Retrodisplacements. —When pregnancy results shortly after the operative correction of a retrodisplacement the patient should always wear a pessary for the first four months of her pregnancy. This is advisable not only to relieve the freshly shortened ligaments from the strain of holding in place the increasingly heavy uterus, but as a precautionary measure against a recurrence of the displacement with the danger of abortion. After the fourth month, when the uterus has risen out of the pelvis sufficiently to attain the support of the sacral promontory, retrodisplacement becomes impossible and the pessary can then be removed with safety.

Mrs. E. H., twenty-two years of age, was operated upon for an extreme, unreducible retroflexion of the uterus, accompanied by prolapse of both ovaries. Following the operation, as the patient was to be in a distant city for six months, a retroflexion pessary was introduced as a precautionary measure. Coitus was not allowed for three months after operation. During the fourth month it was resumed and conception occurred. The pessary was removed at the end of the fourth month of pregnancy and she was delivered at term of a living child. Subsequent examination showed no return of the displacement.

Treatment of Retrodisplacements.—Before deciding on the line of treatment to be carried out in any individual case of retrodisplacement, it is necessary to distinguish the special type to which the displacement belongs. In the congenital form, the

earlier the displacement is corrected the greater the chance of effecting a cure. If the uterus in such cases were put in normal position at the time of puberty, it would probably function in as normal a manner as though it had never been displaced. My best results with these cases have been obtained when I have been able to correct the displacement very soon after the onset of menstruation. Occasionally menstruation begins with such very marked symptoms and such extreme suffering on the part of the patient that the gynecologist is consulted at once. If the parents of the girl are intelligent enough to understand the condition, they usually accept the situation, and request the operative replacement of the uterus; but more often they take the stand that because the girl is but a child, and not a woman, it is impossible for her to have any "female complaint," as they are pleased to put it. If one has been careful to previously inquire into the menstrual history and then to investigate the pelvic condition when operating on interval cases of appendicitis in young girls, the opportunity will often present itself to correct a congenital displacement at the time the appendix is removed. In congenital cases, the pessary is not to be considered alone as a method of treatment, as it does not cure such cases and is associated with a more or less frequent handling of the genitals that should always be avoided in young girls.

We are thus limited in these cases almost exclusively to surgical measures. The anterior vaginal wall should be lengthened and the utero-vesical ligament attached at a somewhat higher point on the cervix. This procedure allows the cervix to swing freely back perpendicular to the axis of the vagina as the fundus is brought forward, and in many cases no further operative procedures are required, provided the fundus can be kept forward long enough to allow the round ligaments to shorten sufficiently to hold it in place permanently. After the plastic work on the anterior vaginal wall and utero-vesical ligament has been carried out, a retroversion pessary is introduced and allowed to remain for from four to six months. It is usually not necessary to remove it more than once or twice during this time, when a light anesthetic may be given, if desired.

If this treatment does not suffice, it will be necessary to shorten the round and utero-sacral ligaments in order to effect a permanent cure. In traumatic retrodisplacements, if seen at the

time of the accident or shortly afterwards, and taken promptly in hand, replacement of the uterus and the use of a pessary will usually effect a cure. When the displacement has existed for a year or more, the use of the pessary will not, as a rule, prove curative, and resort will have to be had to surgery.

Postpartum retrodisplacements offer the greatest hope of a cure by the pessary, but prophylaxis is quite important in this type. The prolonged dorsal position assumed by the average woman after childbirth is undoubtedly responsible for many retro-displacements. After the first few days, following delivery, it is wiser for the woman to keep on her side, and a certain part of the time on her face. Many women are in the habit of lying on their face in bed, so that this form of treatment is to them no great hardship. In this position gravity will keep the fundus forward by relieving all strain on the round ligaments, enabling them to involute more quickly and more thoroughly. If the parturiate woman never lay on her back, the number of postpartum retrodisplace-ments would be very few. After delivery, say between the third and fourth week, a pelvic examination should be made and the position of the uterus determined. If it is retrodisplaced, the dis-placement should be corrected and a pessary introduced. If the patient has suffered from a displacement after a previous delivery, it is best to introduce the pessary as a prophylactic measure even though no displacement be made out. When the uterus is found in a normal position, repeated examinations should nevertheless be made throughout the six months following delivery, and no chance taken of overlooking a late displacement. It has been my experience that in cases of postpartum displacement the pessary treatment is invariably successful when instituted early. My obstetrical records show postpartum retrodisplacements in 37.2 per cent. In the cases where the displacement had existed before delivery, it always recurred postpartum. In every case of post-partum retrodisplacement there was a recurrence with succeeding deliveries, and in many of these cases there was a recurrence in the early months of succeeding pregnancies. Just how often this would have occurred without treatment I cannot say, because in these patients I always introduce a pessary as a prophylactic measure whenever the diagnosis of pregnancy is made before the fourth month. Thus in a general way I may say that when a dis-placement occurs postpartum, it will always recur with succeeding

confinements and often in the early months of pregnancy as well. With the proper use of the pessary for from four to six months postpartum, a subsequent operation for the displacement will be avoided. Occasionally cases will be encountered unsuited to the use of the pessary because of a laceration and wide separation of the levator muscles. In these, after a perineal repair, the pessary can often be used with success.

The pessary may not always effect a permanent cure, but if properly fitted will keep the uterus in place long enough to cure the sterility. Some cases cannot, and many should not, be subjected to a major operative procedure for the correction of a displacement where the uterus can be kept in position by a pessary, even though the pessary may have to be worn over a considerable period of years.

Little is to be gained by the line of treatment often advised of gradually raising the uterus into position by the use of tampons. Suitable medicated tampons are occasionally of value as a preliminary treatment to replacement, but only with the idea of relieving the congestion and pelvic tenderness that make replacement difficult, or impossible, without the administration of a general anesthetic.

The retroflexed gravid uterus should always be replaced as soon as the diagnosis is made. If this is done, and a pessary worn for from three to four months, many an abortion or serious operation will be prevented, and the danger of incarceration avoided. It is true that once in a while the retrodisplacement is corrected spontaneously in the course of the pregnancy, but this is the exception, not the rule, and early manual replacement is always to be advised.

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CHAPTER XVI

OVARIAN STERILITY

Gross and histological description of nonovulating ovary—Case reports—Ovarian disease—Operative treatment of ovarian sterility—Ovarian decapsulation.

As conception can only result from the proper conjugation of a spermatozoön and an ovum, deficient ovulation becomes an absolute bar to fecundation. This form of sterility has long been the least understood of any, and much of great value regarding it has recently been developed by the work of Edward Reynolds.

Gross and Histological Description of Nonovulating Ovary.— His description of the nonovulating ovary, from both the gross and histological point of view, is so carefully and brilliantly worked out that I cannot possibly do better than to quote him at length. He says:

"At the start emphasis must be laid on the basic fact that the human female is a uniparous animal, and her ovaries, like those of other animals which normally bear but one at birth, normally contain, at one time, but one fully mature follicle, and in consequence of this single occurrence of the mature follicle, but one recent and active corpus. The multifollicular and multicorporal condition which is characteristic of pluriparous animals is not normal in the human female. The ovaries of a fertile woman are, then, characteristically organs of uniform outline which show not more than one thin-walled and projecting follicle or corpus (except during pregnancy and lactation). They have throughout a characteristic soft and elastic feel when taken between the fingers, except when a single mature follicle or active corpus distends one portion of an ovary and yields its characteristic tactile sensation at that point. In contrast, the ovaries of sterile women usually show on gross examination the presence of numerous thin-walled projecting follicles, or of numerous small imperfect-looking corpora, or both. They are of lobulated outline, and on tactile examination between the fingers are tense and resistant

in feel over the whole, or, at all events, the greater part of the organ."

In the histological explanation of these clinical facts, he recognizes three types of mature follicles and two types of corpora. In the first type of mature follicle the membrana granulosa forms a continuous lining in the whole follicle. The follicle enlarges and undergoes progressive protrusion from the surface of the ovary until it ruptures, discharging part of the discus proligerus when the formation of the corpus begins.

The second type has a different structural organization. There are two layers of theca, and the membrana granulosa is not continuous, but is found to be in varying stages of disintegration. This second type is apparently functionally imperfect and its multiple presence at the surface of the ovary is highly characteristic of the ovaries in sterile women.

The third type of follicle he dismisses as unimportant with the statement that "they are usually hemorrhagic, differ essentially in the histology of the internal and external theca, and are probably incipient cystomas."

In the case of the corpora resulting from these follicles, it is uncertain whether they are induced by rupture or the complete disintegration of the membrana granulosa. These corpora do not always contain typical lutein cells, and by some are, therefore, described as pseudo-corpora. The corpora from the second type of follicle are smaller than those from the first, and their development less mature. In classifying the ovaries, examined with the clinical histories of the women, it appeared that the second-type follicles and corpora all belonged to sterile women; while those with the first-type, or normal follicles and corpora, belonged to fertile women.

Cases where the sterility is due to some ovarian condition alone are not as a rule very often met with. Ruling out those cases where the ovaries are the seat of malignant disease and the sterility, of course, incurable, we find two conditions most frequently encountered. In the one there is a complete envelopment of the ovary by adhesions, thus shutting off all chance of the ovum's reaching the tube, and in the second the ovaries are found cystically enlarged with greatly thickened cortex, showing an entire absence of any scars that would denote a previous graafian follicle rupture.

In the first-mentioned class, it is very seldom that we find the ovaries to be completely shut off in adhesions, without there is an accompanying involvement and closure of the tube; but in the second class the disease process affects the ovaries directly, seldom, if ever, involving the tubes, which will be found nearly always patent. Only once at operation have I encountered ovaries normal in size and noncystic that showed no microscopic evidence of any previous graafian follicle rupture. This patient had probably never ovulated. I believe this condition to be an extremely rare one, and I deeply regret that there was no justification for the removal of one of the ovaries for microscopical study. It is in all probability then, very seldom that there is any obstruction to normal ovulation. The mature follicle reaches the cortex of the ovary and without any difficulty is able to rupture and discharge its ovum; only where the cortex has become thickened does rupture become more difficult, and it is not until a final stage in this process is reached that the thickening prevents the final successful liberation of the ovum. In such the follicles are unable to empty and, not being absorbed, remain as retention cysts. These retention cysts multiply as time goes on until they eventually greatly increase the size of the ovary. This is often accompanied by a chronic inflammatory process that further enlarges the ovary. A most instructive example of this class of case was the following:

Mrs. C. P., operation on May 14, 1910, in the Polyclinic Hospital, was twenty-two years old and had been married three years. From the onset of her menstruation she had always suffered from dysmenorrhea, backaches, and continually increasing pelvic pain. She had never been pregnant. Examination showed a uterus of extreme anteflexion, but normal in size, and with no demonstrable lesion of the adnexa. At operation the tubes were found to be normal and could be probed free into the uterine cavity. Both ovaries were enlarged, cystic, and with greatly thickened cortex. A careful inspection failed to disclose the presence of any scars that would denote previous graafian follicle rupture, and it was, therefore, concluded that the case was one of sterility due to defective ovulation.

The operative treatment carried out was resection of both ovaries, and from the right ovary the entire thickened capsule was removed. Convalescence was uneventful, and during the succeeding year she gave birth at term to a living child. Three years later another was born. When last heard from both children were living, and she was pregnant for the third time.

Another instance of this same ovarian condition was found in the following case:

Mrs. J. G., twenty-five years of age, gave a history of two years' sterile married life. Her symptoms in addition to the chief complaint of sterility were

occasional pelvic pain, backaches, and dysmenorrhea. In addition to these she suffered from frequent distressing attacks of mental depression because of her childless home.

Examination showed a small, mobile, retroverted uterus with no demonstrable involvement of the appendages. The retrodisplacement was of the congenital type, associated with a short anterior vaginal wall. At operation on September 17, 1917, in the Polyclinic Hospital, the anterior vaginal wall was lengthened, and at her request, the abdomen opened so that no possible etiological factor in her sterility should be overlooked. Both tubes were normal and were probed free to the uterine cavity. The ovaries showed only slight cystic enlargement, but with great thickening of the cortex, and no graafian follicle scars could be seen. The entire surface of both ovaries was smooth, regular, and glass-like in appearance. The ovaries were resected and a cortical stripping of the right performed. The uterus was then replaced and the round ligaments shortened. Convalescence was uneventful. She became pregnant three months later and was delivered of a living child at term.

OVARIAN DISEASE.—Unilateral ovarian disease, of course, does not necessarily cause sterility, and many patients with even large ovarian cysts are repeatedly delivered without complications.

Operative Treatment of Ovarian Sterility.—For the treatment of ovarian sterility we are almost wholly dependent on surgical measures. All adhesions, whether only limiting the normal mobility of the ovary or so enveloping it as to prevent the ovum from getting to the tube, must be freed. Marked benefit results from resection where the ovary is cystically enlarged, while simple congestive enlargement caused by prolapse will usually subside when the ovary is replaced.

OVARIAN DECAPSULATION.—In the rarer cases where the cortex of the ovary is so thickened as to prevent the rupture of the graafian follicles, decapsulation of one or both ovaries should be carried out. Ovarian transplantation has been successfully performed, but I feel is as yet too much in the field of experimentation to be considered here.

CHAPTER XVII

FIBROID STERILITY

Fibroids—Relation of fibroids to sterility and fertility—Case history—Uterine myomata—Case histories—Myomectomy.

In taking up the consideration of this phase of sterility, much difficulty is at once encountered if we endeavor to apportion to fibroids their relative place as a causative factor in sterility. I shall, therefore, make no attempt to enter a field where so many have failed. That many women with fibroids bear children and that some even show a relatively high degree of fertility cannot be denied, but the consensus of opinion among gynecologists to-day is that the presence of these tumors in the uterus is usually associated with a high rate of sterility and a low rate of fertility. I have used the expression "in the uterus" advisedly, because the pedunculated tumors which lie outside of the uterus act only indirectly on the child-bearing function of the woman.

Fibroids.—Fibroids are a very common growth of the uterus and are encountered more frequently in some races than in others. Clinical records probably very greatly underestimate their frequency, for unless they reach a sufficient size to attract notice or produce well-recognized clinical symptoms, they are often overlooked.

Numerous observers have reported on the presence of fibroids in cases of sterility and lowered fertility, and their records show a frequency of between twenty and thirty per cent in all cases, and twelve to fifteen per cent in women who had borne one child only. The question of age has entered prominently into all discussions relating to fibroids and sterility, but it has always seemed to me without sufficient reason. From thirty-five to forty years is the age at which these tumors most frequently occur, so that before thirty they are generally considered as having little bearing on sterility, but we know that fibroids grow slowly for

years, causing only slight or no symptoms at all, and that when finally diagnosed they may have been present for quite a number of years. Most writers include fibroids among the causes of sterility, but differ as to the relative importance of their influence. Some few reverse this and contend that the fibroids are the result of the sterility, rather than the cause. If this were so, in a general sense, then the most fertile women would show the smallest number of fibroids, but one of the most fertile races, the colored race, is also most prolific in fibroids, so much so in fact, that the great pathologist Virchow was led to remark "that a woman of this race
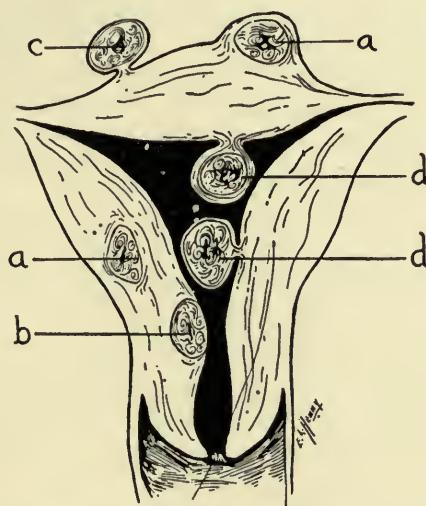
FIG. 17.—SCHEMATIC REPRESENTATION OF VARIETIES OF FIBROIDS (ALLBUTT). a–a., mural. b., submucous. c., subserous. d., intra-uterine.

without a fibroid in her uterus was an anomaly." I hardly feel that the inference that fibroids arise because the normal function of the uterus is in abeyance is a warrantable one.

If there is one thing we do know about fibroids, it is that they grow very rapidly in pregnancy, more rapidly than at any other time, and that after the pregnancy is over they decrease in size just as rapidly, provided inflammatory or degenerative changes have not developed.

Relation of Fibroids to Sterility and Fertility.—The all-important point in the question of the relation of fibroids to sterility and fertility seems to me to be, not the fact of their presence, but of their location and size. The submucous fibroid causes bleeding

and a thickened endometrium, which tends to check conception and favors the production of abortion. The intramural fibroid gives rise to various mechanical obstacles to the continuation of pregnancy, such as deformities and displacements of the uterus, which often result in miscarriage. Furthermore, when the fibroid is in either the uterine cavity or wall of the uterus, it acts as a foreign body which the uterus by muscular contraction is constantly endeavoring to expel. Such a uterus, in a more or less constant state of tonic contraction, is an unfavorable housing for the growing ovum. There can be no doubt that fibroids in the uterus itself play an important rôle in inducing miscarriage. When the tumor has been expelled from the uterus and becomes subperitoneal, this muscular unrest on the part of the uterus subsides and the fibroid ceases to be a factor in the production of abortion or miscarriage. From now on the mere presence or size of the growth has little to do with the causation of sterility, but its location may have a great deal to do with the successful termination of a pregnancy, for when located in the pelvis, even though it be of no very great size, it can greatly complicate or actually prevent delivery.

The promptness with which conception often follows the removal of fibroids in sterile women would indicate that in these cases at least the tumors were the cause of the sterility. In proof of this the following case is a good example:

Mrs. J. H. F., age thirty-six, was married one year without ever having conceived. Menstruation began at fourteen years of age, was always regular, lasting eight days, and was very profuse. Slight dysmenorrhea had developed during the year of married life, otherwise she was free of symptoms other than the sterility.

Examination showed an enlarged retroflexed uterus. The enlargement was irregular in character, indicative of the presence of small fibroids. At operation, through a transverse abdominal incision, four of these, the largest two inches in diameter, were removed from the various parts of the anterior and posterior uterine walls. A larger intra-uterine fibroid was removed from the uterine cavity through an incision made in the anterior uterine wall. Adhesions between the uterus, adnexa, and rectum were separated, the uterus replaced and the round ligaments shortened. Conception promptly occurred and she was confined at term by a breech delivery of a living child. The labor, though her pains were strong, was a protracted one, lasting twenty-one hours. The child weighed six pounds, one and one-half ounces. Her second confinement, a normal eleven-hour labor, resulted in the birth of a living eight-pound baby, and the third confinement, a normal five-hour labor, in the birth of a living child weighing eight pounds and fourteen ounces.

Multiple fibroids of the uterus are attended with a low degree of fertility, but it is not unusual for their removal, even as late as the age of thirty-six, to result in a cure of the sterility. This patient's subsequent obstetrical history is a particularly gratifying triumph for enucleation. Only too often in these cases the woman is deprived of all hope of maternity by a hysterectomy, radium, or X-ray treatment. Had this patient been so treated the world would have been a very dark place indeed for her, and three healthy children would never have seen the light of day. Her first confinement, a protracted breech delivery, with strong labor pains for twenty-one hours, within less than one year after operation, shows how firmly the incision in the uterine wall, through which the fibroid in the uterine cavity was removed, had healed.

Too much importance should not be laid on the accompanying retrodisplacement in this case, as the flexion mentioned was a deformity of the uterus produced by the fibroids in the posterior wall, and the posterior position of the fundus was more in the nature of a sagging due to increased weight. Years of exaggerated muscular activity on the part of the uterus in its endeavors to expel the fibroids had resulted in great hypertrophy of its walls. The anterior wall, which was incised in order to remove the submucous tumor in the uterine cavity, was two and one-half inches thick. When all the tumors had been enucleated and the incision sutured, the breadth of the uterus was greater than that of a three-month pregnancy, yet six weeks after operation, it had involuted to nearly normal size.

In many cases of sterility the fibroids are not large enough to be easily felt and thus may not be suspected. Again, a single fibroid in the anterior uterine wall at the fundus can give the impression of an anteflexion and lead to an error in diagnosis, as in the following case:

Mrs. H. D., thirty-three years of age, had been married two years without ever having become pregnant. Menstruation began at twelve years of age, and was always regular, but lasted seven days and was very profuse. She suffered from only slight dysmenorrhea. Two recent periods had been prolonged to two and three weeks. The husband's semen was normal.

Examination showed an anteflexed uterus with a small fibroid at the fundus. A diagnosis of conditional sterility was made. At operation a dilatation and curettage were first performed, and then three small subperitoneal fibroids were removed from the posterior face of the fundus, and one intramural fibroid one inch in diameter from the fundus anteriorly. This later was beginning to become

submucous, and during its removal the uterine cavity was opened. The right ovary, being large and cystic, was resected. The tubes were normal and probed clear into the uterine cavity. Conception occurred during the first few months after operation, and she was delivered at term of a living child less than one year after her operation.

This patient had been examined by a number of careful men previous to my seeing her without arousing any suspicion on their part of a fibroid as being responsible for the sterility. Again I want to call attention to the fact that in both of these cases of fibroid sterility just cited there was prolonged and profuse menstruation gradually increasing in severity from its onset. This symptom can usually be elicited in fibroid cases, even though the tumor may be too small to be more than suspected. It affords a valuable clue in arriving at a correct diagnosis.

The following case history presents so many points of unusual interest that it is appended as a noteworthy exception to the rule:

The patient, Mrs. H. F., thirty-eight years old, had been married for six years, during which time she had never conceived. Her menstruation was normal, began at the age of fourteen, had always been regular, four days in duration, moderate in amount, with slight pain. She had noticed progressive abdominal enlargement with increasing tenderness and distress, more particularly on the right side of the abdomen, for the past nine years. When the enlargement first began she was advised to be operated upon for the removal of multiple fibroid tumors. At this time she was told that the operation would be one of extreme seriousness, and she, therefore, determined to go as long as she could without it.

Three years later, shortly after her marriage, the tumor had reached nearly to the umbilicus, and surgical advice was again sought. The same diagnosis was made and the same treatment advised as previously, but, as she was very anxious to have a baby, she refused to consent to the operation, she being told that it would in all probability mean the removal of the uterus.

From this time on the tumor gradually increased in size, causing more and more distress, but she still refused operation, in the hope of becoming pregnant. Finally, as she was suffering so much, and as pregnancy had never occurred, she at last decided to submit to operation, and was referred to me by her physician.

In taking her history I found that she had had no regular menstrual periods for two months—only occasionally slight spotting. Examination showed marked protrusion of the right abdomen, extending from the symphysis to the free border of the ribs, slightly to the left of the median line, and around behind in the flank. As far as one could determine this enlargement was due to a hard tumor, slightly irregular in contour. Vaginal examination showed slight bluing about the introitus and on the anterior and posterior wall. The cervix could not be touched or examined with the speculum because of the extreme degree of elongation of the vagina. The pelvis was nearly filled by the tumor, and no portion of the uterus could be felt. The vagina was crowded against the left side of the pelvis. Bimanual examination, at the best, only disclosed a smaller tumor to the left of the large one—probably the uterus. Auscultation gave no fetal heart sounds, but a marked bruit in the left lower quadrant. A diagnosis of probable pregnancy was made,

and the case kept under observation. Because of the upward and lateral displacement of the uterus, the fibroid was considered to be interligamentous.

The patient's condition was little changed during the next couple of weeks. At the end of that time morning nausea was marked and she thought that she had once or twice felt life.

On the 5th of September her general condition was slightly improved. The nausea had disappeared. At this visit her abdominal girth was 39½ inches at the umbilicus, and the greatest circumference 40½ inches, just below the umbilicus. Her weight was 157½ pounds.

On October 19 she felt life, and the fetal heart was plainly made out for the first time. The point of maximum intensity was on a level with the umbilicus, six inches to the left of the median line. She was now about six and a half months pregnant, and her maximum abdominal girth was still only 40½ inches. The uterus could now be quite distinctly mapped out, lying entirely above the brim of the pelvis, in close proximity to the tumor, and the fundus of the uterus was well under the free border of the ribs.

From this time until December 1, there was no change in her condition, except that considerable dyspnea developed, so that she was unable to sleep except in a semi-upright position. There had been no changes in the urine, which was normal.

On December 1 the membrane ruptured spontaneously. On the following night her pains began. She was delivered through a median line incision, extending above and below the umbilicus. As the peritoneum was opened, a large fibroid, interligamentous in character and intimately adherent to the uterus, was disclosed. A great venous plexus ran across from the fundus of the uterus to the tumor, so that it was with some difficulty that a free area of the uterus could be found for incision. Furthermore, the tumor had so pressed the uterus to the left and twisted it posteriorly that the incision through which the child was delivered lay practically to the side of the uterus, instead of in front, making it somewhat difficult to deliver the baby. Severe hemorrhage occurred when the large plexus of veins was incised.

A girl-baby weighing five pounds and five ounces was delivered in a stage of pallid asphyxia, but it responded promptly to artificial respiration and survived.

A study of the tumor now disclosed the fact that it was an intraligamentous fibroid, filling the pelvis and most of the abdominal cavity, well up under the free border of the ribs. It was so intimately connected with the uterus, and as the uterus also contained several fibroids in addition, it was thought best to do a sub-total removal, especially as the patient was rather a poor operative risk. When the tumor was delivered, the patient went into a serious collapse for a few moments, but rapidly recovered.

In freeing the large fibroid, during removal the right ureter was exposed its whole length from the bladder to the kidney, but at only one point was it entirely separated from the surrounding tissues.

The bed of the tumor was so extensive that the amount of raw surface exposed was something appalling, from which there was a very generous oozing. The poor condition of the patient admitted of no delay, so the cavity was packed with iodoform gauze brought out through the cervical stump into the vagina. Over this gauze the opening in the broad ligament was closed and the abdominal wound was sutured in my usual manner.

The tumor was a cystic fibro-myoma undergoing degenerative changes, weighing seventeen founds five ounces.

The patient's convalescence was uneventful. The maximum temperature was

100 2/10, with a pulse of 120 reached on the second day. It then subsided to normal, with a pulse of 88 on the fourth day.

No milk appeared in the breasts, and the baby was put on artificial feeding, to which it took very kindly.

One of the most interesting features of the case, from a medical standpoint, was the fact that the patient went from her fourth month of pregnancy to nearly term, with less than one inch increase in her abdominal girth. When I first saw her, the abdomen was so tense, and the abdominal cavity so completely filled by this enormous tumor, that it was hard to believe that she could possibly continue with her pregnancy, and at the time she was delivered it was a matter of the greatest surprise when we found that the baby was actually nearly of normal size. That the abdomen could grow a pregnant uterus with a five and one-half pound baby, placenta, and amniotic fluid without increasing its circumference more than one inch was a marvel to all who saw the case.

The baby was a healthy female infant, showing no deformity other than a uniform lateral flattening of the head, the biparietal diameter being only three and one-half inches. Whether this shape of the head was due to pressure or not, I am, of course, unable to say, for we occasionally meet with normal cases where the same peculiarly shaped head is present.

The pathological report on the tumor was fibromyoma, undergoing cystic degeneration.

The patient was discharged from the hospital six weeks after operation very much improved in general health, having gained twelve pounds after delivery.

The wound united by primary union, and the cervical stump came down to its normal relation to the vagina, which then showed no undue elongation.

Myomectomy.—I believe that the mere existence of a fibroid tumor situated in the walls of the uterus or in the uterine cavity predisposes to sterility, to abortion, to other dangers of the pregnant state, and to a lowered fertility, and that its removal is indicated when the patient is in a reasonably fertile period of her life and desirous of bearing a child. Myomectomy, even in the presence of multiple tumors, is now established on a firm footing and should always be the operation of election during the active child-bearing period unless strongly contra-indicated. When the operation is performed for sterility in suitable cases the brilliancy of results is really dramatic, as in the cases I have reported above. The success which has attended the development of this operation is as remarkable as it is deserved.

The nature of the operation for uterine myomata will naturally vary according to the situation and attachment of the tumor. Simple myomectomy or the removal of the tumor without any of the uterine tissue is easy of performance when the tumor is encapsulated, more difficult when the tumor involves the surrounding muscular tissue. These can at times only be enucleated by taking away as well more or less of the uterine tissue with

which the tumor is incorporated and even opening into the uterine cavity, as occurred in two of the cases reported. It may truly be said of the operation of myomectomy that the exact mode of removal can never be decided upon until the abdomen is opened and the condition ascertained by direct inspection.

When the enucleation is completed, the uterine walls should be cleared of all partially detached tissue and trimmed so as to snugly overlap the bed from which the growth was removed. Rows of buried sutures are introduced from the bottom of the wound upwards, in succession, so as to completely approximate the sides of the wound, leaving no dead space; finally the peritoneal surfaces are brought together by a superficial running stitch.

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CHAPTER XVIII

SUBINVOLUTION AND SUPERINVOLUTION

Subinvolution—Causal factors—Symptomatology—Case reports—Treatment—Super-
involution, puerperal atrophy—Causal factors—Symptomatology—Diagnosis—
Case reports.

Subinvolution is the term employed to designate a condition of the uterus occurring after parturition when the organ is left in an enlarged and congested state, not having returned to its normal size.

After delivery the uterus, as a rule, rapidly decreases in size, so that by the end of the lying-in period it has returned to normal or nearly normal dimensions. This process is called involution and is generally complete by the end of the sixth week postpartum, when the red lochia has ceased. How this process of "involution" is brought about is still open to question. It is characterized by a marked and rapid reduction in volume of the muscular tissue, probably brought about by chemical action, and also by certain difinite changes in structure as well. The contraction of the muscular walls of the uterus compresses the blood vessels, many of which are thus obliterated and eventually disappear. The parous uterus never returns to quite the size it was before pregnancy.

The characteristic morbid features of subinvolution are congestive enlargement of the body of the uterus with congestive thickening of the endometrium. The cavity of the uterus is also increased in size.

Subinvolution, Causal Factors.—Subinvolution is caused by conditions which interfere with the proper muscular contraction in the uterus after delivery, such as weak muscular tone, postpartum hemorrhage, retained secundines, and infection. Infection is a very frequent cause, and subinvolution nearly always accompanies postpartum pelvic inflammation. Lacerations of the cervix and perineum contribute toward subinvolution only in so far that they predispose to infection.

SYMPTOMATOLOGY.—Subinvolution generally gives rise to the characteristic symptoms of pelvic drag, backaches, and menorrhagia,

though it does not in itself produce any marked disturbance of health. On examination the uterus is found larger than normal and more or less sensitive to direct pressure.

In subinvolution a state of chronic venous congestion exists, which in either a normally situated uterus or one that is displaced is a frequent cause of sterility and diminished fertility. The very definite pathological changes which occur in the uterus itself as a result of subinvolution vary according to the length of time the condition has existed. In time the congestion becomes chronic, leading to permanent changes in all the uterine tissues. The most serious of these are an increase in connective tissues in the uterine walls and a thickening or overgrowth of the endometrium, known as "hyperplasia" or "hypertrophy." This change in the endometrium makes of it an unfit soil for the growth of the fertilized ovum, so that even if embedding takes place early interruption of the pregnancy is the rule. Many women with subinvolution of the uterus conceive more frequently than those where this condition is not present, because their pregnancies end in abortion, but after the condition has existed for several years, incapacity for conception eventually arises from the resulting endometrial changes. The following example of conditional sterility due to postpartum subinvolution of the uterus is quite typical of a class of cases frequently met with:

Mrs. D., age thirty-seven, was married seven years. She had given birth to two full-term children; the last delivery was five years before she consulted me and had been a difficult instrumental one. It was followed by an infected and prolonged puerperium. From this time on she suffered constantly from pelvic pain, menorrhagia, and leukorrhea.

Examination showed an enlarged subinvoluted uterus in normal position and with no restriction in mobility, but markedly tender on palpation. The uterus was curetted, removing a greatly thickened endometrium, irrigated, and packed, and her convalescence was uneventful. Prompt relief of all symptoms followed, menstruation taking place normally for the first two months after operation. During the third month conception occurred, and she delivered normally at term of a living child.

Treatment.—The treatment in cases of subinvolution where the condition has only existed for a short time is simple and limited to a daily hot douche given at 115°, and continued for twenty minutes. Every other day a boroglyceride or ichthyol and glycerine vaginal tampon should be inserted and allowed to remain for twelve hours.

In more severe cases and those seen only after the disease has existed for some time the hypertrophied endometrium should be

removed with a sharp curette, the uterus irrigated and then tightly packed with iodoform gauze. The gauze is allowed to remain in place for three days to stimulate contractions in the uterus, and involution may be further hastened during this time by administering ergot up to full physiological tolerance.

Puerperal Atrophy of the Uterus.—Superinvolution of the uterus, or, as it is perhaps better designated, puerperal atrophy of the uterus, is a rare condition where following childbirth the process of involution does not stop when the uterus has reached normal size, but goes on beyond this point, leading to a marked degree of atrophy in the organ. Sometimes the atrophy is slight and the uterus later regains its normal size and functional activity; more often the change is permanent and menstruation never reappears. A slight degree of atrophy may be caused by lactation, especially prolonged lactation, but this is probably physiological.

Symptomatology.—In superinvolution the uterus is decreased in size, its walls are not as thick as normal, and the endometrium is very thin or entirely absent. Severe puerperal infection is the most frequent cause of superinvolution, but it should be borne in mind that there are other diseases not connected with the puerperal state, such as myxedema, tuberculosis, Addison's disease, Graves's disease, and insanity, to which may be added great emotional distress, that can cause atrophy of the uterus and amenorrhea.

Sterility is a usual accompaniment of superinvolution, and whereas the latter may be the result of ovarian atrophy, no pathological changes in the ovaries in this condition have ever been demonstrated.

Diagnosis.—The condition of atrophy is to be easily diagnosed from the history of an amenorrhea dating from childbirth and persisting long after lactation has ceased. Examination will show a small, hard uterus and pale cervix.

Genuine cases of puerperal atrophy of the uterus are of such rare occurrence that every case should be recorded. The following case is such an unusual one that I give the history in full:

Mrs. T. S., age thirty-eight years. Pari-1. Following an uneventful labor the patient developed on the fifth day a very severe auto-intoxication from retained lochia. Following this there was an absolute agalactia. She menstruated scantily a few times during the year after delivery and then stopped entirely, but had no other unfavorable symptoms. This condition continued unchanged for ten years, during which time repeated examinations were made, always disclosing a small, superinvoluted uterus. The various gland derivatives were administered at different times during this period, but without any favorable result.

At the beginning of the eleventh year, menstruation reappeared, there being a slight show for two days. The next month the flow was more profuse and lasted the same length of time. The third month she had a normal menstrual period, moderate in amount, lasting five days. Conception took place immediately after this period and she was delivered at term.

I have tried all methods of treatment in cases of superinvolution and am obliged to confess that I know of none of enough value to recommend here.

CHAPTER XIX

TUBAL OCCLUSION

Etiology — Route of infection — Catarrhal conditions — Case reports — Gonorrheal sterility—Acute infections—Trauma—Case report—Cases of doubtful etiology.

We now come to the consideration of one of the most interesting types of sterility, to me the most interesting of all: those of tubal occlusion. Just how frequently tubal occlusion should be held responsible for sterility is still a question much under discussion. While there are some who teach that it is the cause in only a small percentage of cases, there are others who hold it accountable for a great majority. My own belief is that it plays a very important rôle in sterility, and in cases of absolute sterility is one of the most important factors to be considered. I know of no way to definitely determine the exact percentage, but I do know that when the occlusion is bilateral the woman cannot possibly conceive, and that in such cases the only treatment which offers any hope of a relief of her sterility is surgical.

Etiology.—In the great majority of cases, tubal occlusion is the result of inflammation of the fallopian tubes, and such inflammation is in an overwhelming number of instances produced by gonorrhea. The ravages of this disease generally so seal off the tubes as to make conception out of the question. Although the contents of the tube may be absorbed, spontaneous reopening of the fimbriated end of the tube, when once it has become occluded, almost never takes place, and surgical measures offer the only hope of effecting a cure. Only a small percentage of these cases of closed tubes are the result of outside involvement, such as might result from the spreading infection of an appendicitis or from an attack of pelvic peritonitis, resulting from a postpartum infection.

Route of Infection.—The path by which the infecting organism (gonococcus) reaches the tube lies through the cervical canal and uterine cavity. The disease is always bilateral, although one tube may be involved for some little time in advance of the other. The structure of the tube first attacked is its epithelial lining, the disease later spread-

ing to its muscular layers, even implicating the peritoneal covering when the gonococci can be found in all coats of the tube. As the infection spreads along the tube, pus begins to form, and by the time the distal end is reached the fimbria become drawn into the lumen of the tube, bringing its peritoneal surfaces together, which then agglutinate and close the tube.

The inflammation, at first catarrhal as a rule, later becomes purulent, and there may be formed an abscess of the tube. This is known as a pyosalpinx and may reach so large a size as to even rupture spontaneously or as the result of trauma. While complete absorption of the pus rarely takes place, cases are occasionally met with where the tube is left with only a small amount of cheesy exudate in its interior and with greatly thickened walls. Eventually the contained pus loses its virulence, the pus cells disappear, and the tube is left considerably distended with a clear fluid, while its walls are thin and almost transparent (hydrosalpinx).

Hydrosalpinx is not very common. Gonorrheal salpingitis more usually results in an overproduction of connective tissues in the walls of the tube, producing a permanent deformity with constriction and even obliteration of the tubal canal.

In the acute stage of the infection, the tube is very friable, tearing easily on the least traction or squeezing, and there is marked edema present. By this time the tube is usually closed off and becomes markedly distended as the amount of pus increases. Sometimes the increase in tension may be great enough to force open either end of the tube. When this takes place at the distal end, it always results in a localized peritonitis and occasionally in a general peritonitis with a fatal termination. When occurring at the proximal end the drainage thus established through the uterus usually continues until a cure is effected.

It is possible to restore the patency of occluded tubes by operation, but this should never be attempted until the active infection is long since past. Surgical intervention when carried out at the proper time need not necessarily be followed by a reclosure, as adhesions form only in the presence of infection. The so-called "club-tube" is generally taken to be typical of gonorrhea and is easily recognized. It is often seen free from adhesions, has an expanded and smooth distal end showing no opening, and no fimbriæ. The latter lie inside the tube where they were drawn at the beginning of the infection. If this end of the tube be now carefully studied, it is usually possible to detect a

small depression, the "gonorrheal dimple," at some point which denotes the site of the original opening. Rarely is occlusion found in the middle third of the tube and practically never in the proximal end. I have only once met with a complete obliteration of the lumen of the tube.

The following case is an excellent example of gonorrheal sterility cured by operation:

Mrs. R., when I first saw her, was thirty-two years old. Menstruation had begun at the age of twelve, was irregular, lasting four days and unaccompanied by pain. She had been married for eight years, during all of which time conception had never occurred. At the outset of her married life her husband had infected her with gonorrhea, which, accompanied by a severe pelvic peritonitis, had run its typical course. Over a number of years she had suffered from frequent subacute exacerbations, and from the very first attack there had been marked changes in her menstruation, which was accompanied by menorrhagia, dysmenorrhea, backaches, pelvic pain, and nervousness, all increasing in severity.

On examination she was found to have a rather small uterus, anterior in position and much restricted in mobility. The right adnexa were enlarged and adherent; the left prolapsed and also enlarged and adherent; both were tender on palpation. At operation on April 10, 1903, in her home, the pelvic condition was approached through an anterior vaginal incision, but on opening the peritoneal cavity was found much too extensive to treat by this route. The abdomen was therefore opened, when the following condition was revealed:

Both ovaries were small and buried with the tubes in extensive velementous adhesions which held them fast to the broad ligaments, posterior face of the uterus, and rectum. These adhesions were separated, and the tubes and ovaries released. On inspecting the tubes, they presented the typical club formation with closed extremities. Upon cutting the left tube, its lumen was found completely obliterated, and the entire tube was removed. The accompanying ovary had been so mutilated during the process of freeing that it was also removed. The right tube, after opening its distal end, was found to have a patent lumen which could be probed into the uterine cavity. As this end was torn and ragged from the separation of adhesions, about one inch of it was removed and a plastic reconstruction carried out. Subsequent convalescence proved uneventful; there was a marked improvement in all symptoms; menstruation became regular and painless. Eighteen months after the operation she gave birth at term by a normal delivery to an eight-pound baby, and again eighteen months later to another. Both children are living and well.

This case was one of the most instructive in my series, and had the patient not been separated from her husband after the birth of the second child, might have been one of the most productive. The pathological picture presented at the time of operation was typical of the ravages of gonorrhea when once the infection gains access to the pelvic organs.

The complete embedding of the ovaries prevented the release of the ova which, even had escape been possible, could not have been taken

up by the tubes in their occluded condition. Yet observe the lightning-like rapidity with which conception occurred when once the path to the uterus had been cleared of obstruction—eight years of suffering and sterility, operation with a cure of all symptoms, and successful delivery within eighteen months.

This woman was absolutely sterile, as are countless numbers of others who are operated upon every year, where a radical removal of the pelvic organs is always the operation of election, at which no attempt is ever made to conserve the child-bearing function of the woman. First infected by her husband and then robbed of all hope of maternity by her surgeon, she is left a pathetic figure in society, a martyr to radical surgery.

Another typical case of gonorrheal sterility was the following:

Mrs. L. K. when first seen was thirty-three years of age, had always enjoyed good health, and her menstruation, which began at the age of fourteen, was regular, lasting four days, scanty in amount, but painless. She had been married two and one-half years without having conceived. Shortly after her marriage she suffered an acute attack of abdomino-pelvic peritonitis followed by a slow convalescence and a persistence of the pelvic pain. Menstruation became irregular, painful, and profuse, at times lasting for two weeks.

On examination she was found to have a rather small, anteflexed uterus, which was tender on palpation and slightly restricted in mobility. In examining the adnexa, no marked enlargement could be made out, but there was considerable tenderness present on both sides. At operation on August 10, 1916, in the Polyclinic Hospital, both adnexa were found to be adherent to the posterior face of the broad ligament with here and there an adherent tab of omentum. Both tubes were closed, terminating in characteristic clubbed ends. The left tube was a large, flaccid hydrosalpinx, surrounding and densely adherent to an enlarged cystic ovary. As these appendages seemed hopelessly diseased, they were removed entire. When the right adnexa were separated from adhesions, the ovary appeared quite normal and was not further disturbed. The tube was opened at the gonorrheal dimple and the fimbriæ released. Then with some difficulty, because of the greatly exaggerated kinks and tortuous course of the tube, the probe was finally passed into the uterine cavity. Convalescence was uneventful. Conception occurred during the third month after operation, and she was delivered at term of a living child.

Another case of gonorrheal closure, but presenting a rather different picture follows:

Mrs. P. R., thirty-two years of age, who had been married four years without having conceived; menstruation had always been normal before marriage, but afterwards she had developed dysmenorrhea, backaches, and pelvic pain.

When she was examined, the uterus was found retroflexed, enlarged, and adherent. At the fundus there was an intramural fibroid about two inches in diameter with two smaller subperitoneal ones near by. At operation on May 31, 1918, in the Polyclinic Hospital, the presence of the fibroids was verified and the

adnexa of both sides found adherent with the uterus. Both tubal extremities were
closed. The adhesions were extensive and firm, so that considerable difficulty was
encountered in separating the tubes. The left tube was extensively damaged during
the process of separation. As it could not be probed after opening the distal end,
it was removed. The right tube was opened with little difficulty at the seat of
the gonorrheal dimple and freely probed into the uterine cavity. Both ovaries were
normal in appearance. The uterus, which had been freed from adhesions, was
replaced, the fibroids removed, and the round ligaments shortened. Convalescence
was uneventful.

   After operation all her unfavorable menstrual symptoms were cured; she
conceived during the eleventh month following and was delivered of a living child
at term.

In the above case there were two well-recognized causes of relative
sterility present: adherent retroflexion and an intra-mural fibroid,
with one of absolute sterility, tubal occlusion. Such a combination of
etiological factors in the same case, any one of which was enough to
have caused the sterility, is rather unusual, and that Nature should
have responded so promptly after the handicap was removed was
extremely gratifying and encouraging.

Acute Infections.—Another type of tubal occlusion sterility
cases frequently encountered is that caused by acute septic infection
resulting from abortion, miscarriage, or labor. In these the etiological
factor may be either the staphylococcus or the streptococcus. These
reach the tube by direct extension along the lining membrane of the
uterus, set up an inflammatory reaction, and the resulting salpingitis
leads to closure of the tube at some point or other, usually at the distal
end. The closed end, however, is not found sealed off with a free,
club-like extremity and gonorrheal dimple, as is seen in the specific
cases, but is usually matted and densely adherent to neighboring struc-
tures.

In another class of these postpartum cases, the infection gains
entrance through some traumatism of the birth canal, such as lacera-
tions of the vulva, perineum, vagina, or cervix, and travels through the
lymphatics, producing in the course of the disease a local or pelvic
peritonitis. Here the tubes resting on the inflamed peritoneal surface
become involved secondarily by continuity, and the plastic exudate
thrown out as a result of the peritonitis closes their fimbriated ends.

This condition was well instanced in the following case:

   Mrs. A. C., nineteen years of age, was always well and gave no history of any
venereal disease. Menstruation began at the age of fourteen, irregular, three
days' duration, moderate in amount and accompanied by slight pain. She had been
married for three and one-half years. Some time after marriage she had an

abortion at six months, which was followed by an attack of pelvic peritonitis and a protracted febrile convalescence. Recovering from this, she was left with more or less constant abdomino-pelvic pain, more marked on the left side, and had never again become pregnant. The sterility, when I first saw her, was of two years' standing.

Examination at this time disclosed an anteflexed uterus with very definite restriction in mobility. The slightest attempt at manipulation caused much pain. The right adnexa were negative; the left were enlarged, prolapsed, adherent, and tender. At operation, on September 17, 1910, at the Polyclinic Hospital, the appendages of both sides were found to be prolapsed and adherent. Both tubes were closed at their distal ends by adhesions, while the ovaries, which were only slightly adherent, appeared otherwise normal. All adhesions were freed. The tubes were opened and probed into the uterine cavity. Convalescence was uneventful.

She was delivered eleven months later, at seven and one-half months, of a living child.

The infection responsible for the tubal closure in this patient had undoubtedly gained an entrance through some lesion of the lower genitalia and traveled up the lymphatics, causing a pelvic peritonitis, for the tubes themselves presented no evidence of a previous inflammatory involvement, with the single exception of their fimbriated ends. These were closed by adhesions to the pelvic peritoneum where they had, in all probability, become agglutinated at the time of the acute puerperal infection. After the tubes were released they appeared quite normal, so that any resection or reconstruction was unnecessary.

A case of tubal occlusion of doubtful etiology follows:

Mrs. E. T., twenty-four years of age. She had always been well and denied any venereal infection either before or after her marriage, which had been nine years previous. Menstruation began at the age of twelve, was regular, lasting six days, moderate in amount and painless. Within two years after marriage her first and only child was born by a normal delivery, followed by an uneventful puerperium. After this she had never conceived again, though very anxious for another child. Marked changes in menstruation developed, the flow becoming of longer duration and quite painful. In addition, she now suffered from backaches and occasional pelvic pain. Her chief complaint, however, was the sterility of seven years' standing.

Examination showed a slight laceration of the cervix, but no evidence of any inflammation. The uterus was normal in size and position, but markedly restricted in mobility. The appendages on both sides were slightly enlarged, prolapsed, adherent, and tender. At operation on October 15, 1910, at the Polyclinic Hospital, the adnexa of both sides were found to be prolapsed and adherent to the pelvic peritoneum posteriorly. The tubes were closed but otherwise presented no gross evidence of disease. The ovaries appeared normal. All adhesions were easily separated, the tubes opened and probed into the uterine cavity. Convalescence was uneventful. Conception promptly resulted, and she was delivered at term of a living child ten months after operation.

As has been said, the source of infection in this case was uncertain, careful inquiry, several times repeated, failed to elicit any history of a previous gonorrhea, nor could she recall any details of her puerperium that would indicate an infection at that time. It is more than probable that this infection was of puerperal origin, which would conform with the clinical findings at the time of operation. The rapidity of the cure in this case was almost startling. Seven years of sterility, operation and successful delivery within ten months!

Another instructive case of postpartum closure was the following:

Mrs. L. V., twenty-seven years of age. Menstruation began at the age of fourteen, irregular, lasting ten days, most profuse and with considerable pain. She had been married for eight years. During that time had had one miscarriage and given birth to two children at term by normal deliveries, the last child being born four years previously. At the last confinement she had been infected and, though extremely anxious for more children, had never conceived again. She suffered constantly from menorrhagia, dysmenorrhea, and pelvic pain.

Examination showed a uterus normal in size and position, but with marked restriction in mobility. The adnexa of both sides were slightly enlarged and tender on palpation, but no adhesions could be made out. At operation, on October 27, 1916, at the City Hospital, the adnexa were found to be adherent to the broad ligaments and to the uterus. The ovaries, when separated from the adhesions, appeared to be normal, but both tubes were considerably thickened throughout their whole extent and occluded at their distal ends. On opening the tubes, the right could be probed free into the uterine cavity. The left was obliterated in its middle third, and the probe could not be made to pass the obstruction. This obliterated portion was, therefore, removed, and the distal portion anastomosed to the proximal over an inlay of large-size kangaroo tendon; the idea of the tendon inlay being to keep the tubal canal patent until the anastamosis had united. Convalescence was uneventful. Following the operation she was relieved of the pelvic pain and menstruated normally for two years and eleven months. Conception occurred and she was delivered by a normal labor at term.

The delay in conception in this case was probably due to the fact that the tubes, being considerably thickened at the time of operation, the result of extensive disease in the past, did not function until the chronic inflammation had cleared up. Such a marked thickening of the tubes as existed in this case pointed to a direct infection from the uterine cavity, rather than to invasion by the lymphatics. Whether conception in this case took place through the anastamosed tube or not could not be determined, and probably never will be. Personally I have never been able to trace a cure of sterility to this operative procedure, though I have used it numerous times, but several are reported in the literature that give me hope of ultimate success.

The next case is one of more than passing interest, and is so

instructive that I place it under this head, though the etiology was uncertain.

> Mrs. C. B., twenty-eight years of age. Menstruation began at the age of sixteen, was always regular, lasting four days, moderate in amount and painless. She had been married three years and had first conceived on her honeymoon. This pregnancy was interrupted at two months and she did not conceive again for two and one-half years. It was with this second pregnancy that I first saw her. She gave a history of ten weeks' amenorrhea and presented all the clinical symptoms of unruptured ectopic pregnancy.
>
> Examination showed the uterus anterior in position, slightly enlarged, tender, and with marked restriction in mobility. Both tubes were enlarged and tender. The right was much larger than the left, prolapsed but not adherent. She had been curetted on a diagnosis of incomplete abortion some weeks before. At operation on November 21, 1918, at the New York Nursery and Child's Hospital, a large unruptured right tubal pregnancy was removed, together with an adherent congested appendix. On inspecting the left tube it was found to be prolapsed, slightly adherent, and closed at its distal end. After separating the adhesions it was opened and probed into the uterine cavity. Both ovaries were normal in appearance and were not disturbed other than to free them from slight adhesions. Convalescence was uneventful. Conception promptly occurred and she was delivered at term by a normal labor of a living child in less than one year after operation. Within six months she again conceived, but I have been unable to learn the outcome of this pregnancy.

The nature of the infection in this case was uncertain, but as only one tube was occluded, it is more than probable that it resulted from infection at the time of the induced abortion shortly after marriage. Although the patient was pregnant in the right tube at the time of operation, I have included her in this series because, with the removal of the right tube in the presence of the occluded left, she became a case of absolute sterility and would have so remained had the occlusion of the remaining tube not been relieved. This case is a good illustration of the importance of always examining the opposite tube when operating for tubal pregnancy, not only because of the possibility of the existence of a bilateral tubal pregnancy, but because the remaining tube may be occluded and the woman left hopelessly sterile unless the occlusion is relieved.

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CHAPTER XX

CONTRACEPTIVES

GENERAL REMARKS IN REGARD TO BIRTH CONTROL

Prevention of conception is a very common practice among civilized people of the present day. Practiced clandestinely and in a small way probably from the beginning of all time, it is now so widespread as to threaten the very survival of the race. The movement has lately grown by leaps and bounds, obtaining frequent mention in the public press and even from the pulpit. This has led to the almost wholesale establishment of "birth-control" societies holding public meetings and regularly publishing official organs for the wider dissemination of their infamous propaganda.

One of the greatest authorities on sterility, Dr. Englemann, has stated it as his belief "that the avoidance or the prevention of conception if possible, the premature termination of pregnancy if need be, are factors far more potential of causation of decreasing fecundity than is the progress of gynecic science to the contrary."

At this point I should like to stop for a moment and review some of the principal arguments advanced by the advocates of birth-control in favor of their movement. In one of their recently published books we find the following summary of woman's position in the world to-day. "Women in all land and all ages have instinctively desired family limitation. It has been manifested in such horrors as infanticide, child abandonment, and abortion. The only term sufficiently comprehensive to define this motive power of woman's nature is the *feminine spirit.* That spirit manifests itself most frequently in motherhood, but it is greater than maternity. Woman herself, all that she is, all that she has ever been, all that she may be, is but the outworkings of this inner spiritual urge. Woman's desire for freedom is born of the feminine spirit, which is the absolute, elemental, inner urge of womanhood. It is the strongest force in her nature; it cannot be destroyed; it can merely be diverted from its natural expression into

violent and destructive channels. The chief obstacles to the normal expression of this force are undesired pregnancy and the burden of unwanted children. Driven by the irresistible force within them, they will always seek wider freedom and greater self-development, regardless of the cost."

It would be difficult to find a more untruthful statement of woman's past or a more hopeless prophecy of her future than is contained in the above quotation from one of their recent publications. The true woman, the one deserving of the name, has always, in all times and in all lands, instinctively desired children. If she has felt the "inner urge" tempting her to family limitation, she has bravely stifled it and nobly continued in the right path, a glory to her sex, her country, and her Creator. It has been well for the world that such women have predominated, and it is to be devoutly hoped that they will continue to predominate throughout all ages. The number that have practiced infanticide, child abandonment, and abortion have been few in comparison, or we should have long since passed into oblivion. To call the motive power that may tempt a woman to practice birth-control by the use of contraceptives or to kill or abandon her child the "feminine spirit" and to rate it as greater than the maternal spirit is such a base slander of womanhood that I marvel her sex has been so slow in resenting it. All honor to the few who have.

Again, turning to the same source of misinformation, or rather malinformation, quoted above, we find the following: "Excessive child-bearing is now recognized by the medical profession as one of the most prolific causes of ill health in women. There are in America hundreds of thousands of women, in good health when they married, who have within a few years become physical wrecks, incapable of mothering their children, incapable of enjoying life." But who is to decide the question of what constitutes excessive child-bearing for the individual woman? Certainly not the lay woman writer or the woman herself. Better leave the question to the physician to decide, or should procreation then be stopped altogether in the interest of these comparatively few thousands? Would it not be better to decide on the fitness of the man and woman before marriage, to so guard the woman that she will not have to reap the harvest of his "wild oats" or become the victim of ignorant obstetrics when her children are born, both such prolific causes of marital ill health?

"Each and every unwanted child," says the same "authority," "is likely to be in some way a social liability. It is only the wanted child

who is likely to be a social asset." Splendid! Then we shall indeed return to the good old days of superstition and credulity, of astrology and chiromancy, when they and their kindred "sciences" shall cast the horoscope of the unborn, yes, even unconceived child, and be called upon to decide as to whether it will be a social asset or liability. There will then be many anxious potential mothers busily engaged with retort and crucible, for even the possession of a powerful and over-mastering intellect such as, according to their high priestess of birth-control, these women will possess, will afford no trustworthy safeguard against the assaults of credulity. There has been no era in the world's history when superstition has not found a congenial soil in the human mind, and these "super-women" will prove to be no exception.

I have made an attempt to analyze some of the utterances of the birth-control propagandist, but I use the word "attempt" advisedly, for he would be a bold man indeed who would pretend to grasp their meaning or try to clothe such a system of demonology with even a plausible appearance of intelligibility. When you listen to the ravings of delirium you often wonder whether or not you are in full possession of your judgment, and in talking with a madman you often feel your own reason begin to totter. An honest effort to find a grain of sense in such a heap of rubbish, or to trace a single constructive thought amid such a parade of ratiocination, leaves the brain in a state of hopeless stupor from the very confused progress of words.

The almost world-wide movement of birth-control is purely a social development conducted principally by women among whom the "detached woman" is most conspicuous, as a revolt against their fancied sex servitude; it is the means by which they hope to attain the basic freedom of their sex. Fortunately, the demand for birth-control is, as yet, limited to a small but noisy minority.

The possible increase in population beyond the bounds of the nation's ability sufficiently and properly to feed has caused great alarm among many thoughtful students of this question, making of them advocates of birth-control. But no such unnatural method is going to solve the problem of overpopulation, unless it be at the expense of the destruction of the nation adopting it. Any nation that attempts by limiting its birth rate to keep its population stationary will just as certainly fall behind, and later succumb to the larger and more vigorous nations. To hold its place in the sun, the nation, just as the individual, must have an abundance of man power. A high birth rate is to be encouraged in every way, and the size of the family only limited

because of definite congenital or acquired defects. Immigration control is preferable to birth-control, but statesmen seem slow to read the handwriting on the wall.

All of the artifices that are used for the prevention of conception or the limitation of offspring are injurious alike to morals and to physical health. These are adopted only too often by the woman to deliberately evade the responsibility of maternity. In some cases they are used as measures of expediency so that the woman, and she may be a mother, and often is, can help earn the daily bread. It is quite probable that should such practices become more general, more women would engage in those pursuits in which a growing family impedes or limits her activities. I should like to quote at this point Dr. Goodell, whose words are food for the deepest reflection.

"The sexual instinct has been given to man for the perpetuation of his species; but, in order to refine this gift and to set limits to its abuse, it has been wisely ordered that a purely intellectual quality—that of love—should find its most passionate expression in the gratification of this instinct. Dissociate the one from the other, and man sinks below the level of the brute. Destroy the reciprocity of the union, and marriage is no longer an equal partnership, but a sensual usurpation on the one side and a loathing submission on the other; wedlock lapses into licentiousness; the wife is degraded into a mistress; love and affection change into aversion and hate.

"Without suffering some penalty man cannot disturb the conditions of his well-being or trespass beyond its limitations. Let him traverse her physical laws and Nature exacts a forfeit; dare he violate his moral obligations, an offended Deity stands ready to avenge them. Onan was slain for disobeying a divine command, by resorting to one of the 'preventive measures' still in vogue to-day. The husband suffers mentally because no *man* can behave in so unmanly a way without a sense of remorse. Further, he suffers physically as a result of the aborted or unnaturally restricted orgasm. Early exhaustion and premature decrepitude result.

"The wife suffers most because she both sins and is sinned against. She sins because she shirks those responsibilities for which she was created. She is sinned against because she is defrauded of her rights. Lawful congress satisfies an important instinct, and is succeeded by calm repose of body and mind. On the other hand, conjugal onanism provokes desires which are denied by the nature of the act. The excessive stimulation of the whole reproductive apparatus remains

unappeased. A nervous super-excitation continues, which keeps up a sexual excitement and hyperesthesia of the parts. Hence the congestive orgasm of the generative organs does not at once pass away, but persists for some time. Thus arises engorgement and inflammations that lead to distorted views of life and the marriage state.

"The very barrenness aimed at by these criminal expedients is in itself a source of disease. In sterile women the absence of pregnancy and of suckling prevents a break in this constantly recurring catamenia, and the physiological congestions of the womb augmented by sexual congestions are, by ceaseless repetitions, liable to become pathological."

All of the methods used to prevent conception are borrowed from the brothel and, as vile and disgusting as they are, they have received welcome sanction in many quarters. They all act in the same way by preventing the spermatozoa from reaching the uterine cavity, either directly by interposing a barrier to their passage, or indirectly by destroying them while they are yet in the vagina. The use of contraceptives greatly affects the moral character of both parties, not only because such unnatural practices violate Nature's laws, but because the absence of children in the household prevents the full development of a spirit of unselfishness and sacrifice. In this way many miss the inestimable boon of the renewal of youth through their children.

It is not uncommon for medical men to tell women who have passed through a difficult confinement that they should never have any more children, and this irrespective of the fact that only too often such difficulty was the result of a lack of skill on their part and that in the hands of one more skilled the case would have been a comparatively simple one. This deters many of the educated class from frequent or even successive child bearing. A certain amount of social condemnation is vented on the father of a large family if the health of his wife in any way suffers, although her invalidism may not be due in the least to the process of parturition.

The rich and leisure class only too often shirk their duty to the next generation from purely selfish motives. When a woman despises the honor and responsibilities of motherhood she commits a crime against Nature, and in thus renouncing what has always been, and must always be, the greatest privilege and glory of her sex, often lays up for herself undreamed of sorrow in the future. Early marriage for all healthy persons is a duty. Such an ideal condition of society would not necessitate the consideration of any question of birth-control.

It is much to be feared that undue familiarity with the laws of

physiological matters will lead to a materialistic view of all sexual questions and affect beyond all hope of redemption the morality of the race. It is quite easy to conceive how licentiousness, protected by methods of avoiding its consequences, and made respectable by covering with a cloak of public approval, could easily lead to an outbreak that would be disastrous to the nation. To the conscience of the individual must ever be left many decisions of the married life. The practice of a certain degree of self-control is ever excellent moral discipline.

Metchnikoff has called the reproductive instinct "the strongest instance of maladaptation caused by civilization." That the sex instinct is to-day far stronger than is necessary for the perpetuation of the species, few will deny, but this fact should not be used as an argument for its illegitimate gratification.

Dr. Scharlieb has very well summed up the argument of birth-control advocates as follows: "They opine that men and women are not strong enough or wise enough to practice self-control. They seem to be convinced that marriage is not for the creation of children, for mutual love and support, nor for the avoidance of sin, but that it is to afford free and legitimate outlet for sex desires, to afford lifelong opportunities for unlimited sex gratification.

"Their arguments contain certain subsidiary reasons, as the difficulty of providing housing accommodations; the impossibility of providing for more than two or three children; the injury inflicted by frequent child-bearing; the difficulty of rearing a large family, and the fear that the world will be unable to support all the children that may be born. In this connection it might be pointed out that a better answer to all this would be a more equitable division of wealth and all it stands for than a restriction of the population. It would seem to most thoughtful students that the philosophy, if any, involved in restriction of the population is purely materialistic and that back of it all is the desire to obtain gratification of the sex act without incurring the responsibility that goes with it.

"Much good always results from the intelligent regulation of the human appetite whether for food, drink, or the instinctive desire between the sexes, and it is a well-recognized fact among physicians to-day that self-control and continence are not in the least injurious."

It is generally accepted that all unnatural modifications of the marital relations and all artificial methods aimed at the prevention of conception, whether by chemical means or mechanical contrivances, are harmful. The routine interference with the spontaneity of so impor-

tant a physical function as the sex act has a far-reaching and dele-
terious effect on the health of those who practice it, and if persisted in
eventually leads to unfaithfulness on the part of the husband, driving
him outside of his home for those pleasures which it denies to him.
On the part of the woman, the habitual use of preventives early leads
to a loss of beauty, and she becomes thin and neurotic, a nuisance to
herself and to everyone else.

While scientists, philosophers, and philanthropists the world over
are debating and deploring a declining birth rate, birth-control is daily
performing its task. Among primitive peoples, it is, if not unknown,
at least unpracticed. Civilization has developed birth-control largely
through the efforts of those wishing frequent and often promiscuous
intercourse without danger of incurring the responsibilities of parent-
hood.

The determining factors leading to the adoption of methods of
preventing conception vary greatly in individual cases, but a false
system of education will be found responsible in the overwhelming
majority. The wife is invariably the one responsible for the family
restriction. The restless condition of our women as developed by the
demands made upon them by the social vagaries of the day, their
expensive tastes and habits all have much to do with the desire for the
limitation of offspring. If to these be added the excesses of everyday
life which unnaturally stimulate the sexual apparatus, we probably get
as near as it is possible to the animating causes of this baneful practice.

When artificial means are used to prevent conception and are
indulged in continually for any length of time, they are quite liable to
create a habit of sterility. Sterility has a special interest not only for
the gynecologist but for all who are interested in the progress and
perpetuation of the race, and birth-control spells disaster alike to the
marriage state and to the home. It should be opposed at every turn,
as it is subversive to the best interests of society, and if put into effect
would destroy all that God and man have built up in past generations.
Practiced clandestinely, it is one of the greatest enemies of the race
to-day, and if legalized, would in a short time sweep us from the face
of the earth.

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CHAPTER XXI

ABORTION, PREMATURE BIRTH, AND FETICIDE

Legal definition of abortion—Criminal abortion—Relative frequency of interrupted pregnancy—Hospital statistics of antenatal death—Toxemias of pregnancy—Prematurity—Infections—Gonorrhea—Hemorrhage—Percentage of prematurity—Case report—Accidents of childbirth.

By common law the fetus *in utero* is not entitled to any legal protections or particular consideration until after quickening has taken place, and its destruction at any time before quickening is not looked upon as a crime. With the appearance of quickening, life is supposed to begin, and thereafter the destruction of the fetus by its host, the mother, or by a third party constitutes only a misdemeanor and is not a crime which can be punished by imprisonment. In some state statutes which take the place of the common law, there is no distinction made between the animate and inanimate fetus; the induction of abortion being punishable by imprisonment for varying lengths of time. The intent to induce an abortion constitutes the crime, which is not dependent in any way upon the consent of the mother or the success of the method employed. When the mother dies, the act then becomes murder.

Notwithstanding the wide prevalance of criminal abortion to-day, there are very few accusations or indictments unless the mother's condition becomes serious, or she dies. One of the great stumbling blocks to the proper punishment of the criminal abortionist is the old common-law interpretation which does not recognize the presence of life on the part of the fetus until quickening has occurred, for this is still the current belief of a large proportion of our population to-day.

Life is present from the time conception first occurs, otherwise there could be no growth of the fetus, and it is the woeful ignorance of this physiological fact that does so much to keep alive the crime of feticide. When the embryo or fetus is destroyed, there is an injury to the prospective individual, for the fetus is a living, independent being, has the right to exist which is common to all human beings, and

is entitled to protection from the State. By the induction of abortion a direct injury is done to the mother, for the operation subjects her to an unjustifiable risk both to her life and to her health. It is likewise an injury to the relatives of the unborn child, and is also an injury to the State by depriving it of a prospective citizen. The direct taking of an innocent human life is always murder. The crime is just as great at whatever stage of existence it is committed. Every "successful" abortion results in at least one murder, that of the unborn child, and in every "unsuccessful" abortion there are usually two murders, that of the unborn child and that of the prospective mother as well.

Criminal Abortion.—Criminal abortion, in its many phases, is more common to the married state, and most of these cases are in women who desire the removal of the pregnancy for purely selfish reasons rather than to save delicate and compromising situations. Although there are many who ask for relief on the ground of poverty and too frequent child-bearing; yet the majority state that they have no time to devote to maternal cares. The attitude of the educated conscientious physician is hostile to abortion except for therapeutic reasons, but there is a large and constantly increasing number of physicians who are willing to constitute themselves both judge and executioner. Nearly all of the desperate and fatal cases of abortion occur in its criminal practice; the most frequent cause of death being perforation of the uterus, peritonitis, and septicemia.

Abortion is an important factor in relative sterility and is of very frequent occurrence. It is impossible to estimate at anything like its true percentage the rôle it plays in the causation of sterility and as a factor in the production of lessened fertility, but its effect in lowering the birth rate is appalling and difficult to even contemplate without a shudder. While it is quite true that spontaneous abortion is of very frequent occurrence, having been estimated as taking place about once in every six pregnancies, a larger number of abortions are intentional, premeditated and induced without the slightest therapeutic or possible social justification.

Medical science, by improved methods of treatment, has been able to accomplish much in the prevention of spontaneous abortion, but social science has been powerless to check the advance of criminal abortion, and feticide to-day, which has reached such enormous proportions, constitutes a very real menace to the race.

Comparatively few pregnancies are really interrupted by the woman herself, considering the frequency with which this is attempted, or by that casual offender, "the kind hearted physician" anxious to relieve distressed womanhood. The great majority of inductions are the work of the professional operator, who abounds in all large centers of civilization. His advertisements appear regularly in the daily press and his "professional cards" are distributed broadcast in the community. I have known of many apartment houses where each incoming family was supplied by the janitress, his stool pigeon, with his cards in common with those of the best neighborhood butcher, baker, and candle-stick maker.

This notorious offender against society has so successfully developed his vocation that criminal abortion is frequently spoken of in foreign medical circles as "the American specialty." This is the man with morals beneath contempt or pity, whose daily life it is a very shame to mention, and with whom they would no more think of associating than with a leper, that countless thousands of our women go to every year to be relieved of the burdens of maternity so that they may have more time and means to indulge in purely selfish pleasures. Some never return, for his mortality is high, many come back to a life of chronic invalidism; all are injured morally. Is there not manhood enough in public life, or power enough in the courts, or virtue enough in the criminal code to give this odious creature his deserts? It would seem not, for he still thrives almost undisturbed.

Chandler, from exhaustive study, has stated it as his firm conviction that more than one-half of the human race dies before birth and that three-fourths of all these are deliberately destroyed.

Abortion is the ending of pregnancy within the first three months before the placenta is formed. After this and up to the period of viability, at about seven months, the term miscarriage is used. When the child is viable, yet born before term, it is spoken of as premature, and if born dead, as stillborn. Abortion occurs with greater frequency than does miscarriage.

Relative Frequency of Interrupted Pregnancy.—The causes of interrupted pregnancy are varied, and there seems but little unanimity of opinion regarding their relative frequency. When a woman has aborted more than once for no assignable cause, a careful inquiry into her history should be instituted and a thorough

physical examination made with the object of determining the cause and carrying out the proper treatment to avoid a similar occurrence with the next pregnancy. Subinvolution of the uterus and chronic endometritis are best treated by tampons of ichthyol and glycerine and with the curette. Displacements of the uterus should be corrected and the uterus supported by a pessary or, failing in this, operative measures should be carried out. Extensive laceration of the cervix, a frequent cause of abortion, should be repaired. Syphilis and toxemia call for their appropriate treatment.

A study of hospital statistics shows that far more than one-half of all antenatal deaths are due either to syphilis, which is responsible for about twenty per cent, or maternal toxemia, which accounts for about ten per cent. Twenty-five per cent to forty per cent are attributable to accidents and complications occurring during labor, while prematurity, malnutrition, fetal deformities, alcohol, and criminal abortion enact their toll.

It has been demonstrated by recent investigation that the unborn child can be safely treated by salvarsan through its mother during the period of its intra-uterine growth. It is quite probable that in syphilis, the placenta and its little-understood ferments exercise for a while a certain inhibitory action upon the infecting organism and thus affords time for treatment to be instituted, even though it is not begun until the pregnancy is well advanced.

Toxemia of Pregnancy.—Toxemia of pregnancy frequently causes the death of the child. This is brought about by some unknown chemical poison, the method of production of which is unknown. When the toxemia is of gradual onset and is detected early, active treatment will often be successful in saving the life of both mother and child, but in the virulent type of toxemia, with sudden onset, a specific treatment has not yet been discovered, and these cases are practically hopeless.

The greatest single group of causes of antenatal and natal death is probably that of the accidents and complications of labor, which are responsible for something like twenty-five per cent of disaster. Most of these, classed as pelvic contraction, tumors, and grave fetal displacement, are diagnosable before labor begins, so that appropriate manipulative or surgical treatment can often be

instituted in time to correct the abnormality. The mortality rate due to these causes should be greatly reduced.

Much worthy endeavor to secure adequate medical supervision of expectant mothers, by the establishment of maternity centers, antenatal clinics, and by seeing that complicated cases gain timely admission to the hospital, has been productive of great benefit, but much remains to be accomplished along these lines as well as in giving to midwives and doctors a more practical education in obstetrics.

The causes of antenatal death are varied. Malnutrition, anemia, etc., exert a strong influence, while acute specific and infectious diseases, such as small-pox, scarlatina, measles, enteric fever, influenza, erysipelas, pyelitis, and pneumonia, are all more or less frequent etiological factors. The chronic diseases, such as tuberculosis, syphilis, diabetes, Bright's disease, and serious cardiac disturbances, produce many antenatal deaths. The tropical diseases, so-called, malaria, cholera, and dysentery, may at times have to be considered in this respect, and the toxemias, pernicious vomiting, albuminuria, eclampsia, and acute yellow atrophy of the liver, cause many an intra-uterine death.

Again, antenatal death may be due to purely mechanical measures, as occurs in retroversion of the gravid uterus, pelvic contraction, obstructing tumors, such as fibro-myomata of the uterus and growths of the ovary, carcinoma of the cervix, cicatricial stenosis of the cervix, vagina, etc., undue ventrifixation of the uterus, and vulvar abnormalities.

Under miscellaneous causes of antenatal death may be mentioned pelvic inflammation, antepartum hemorrhage due to either placenta previa, or accidental separation of the placenta, ectopic pregnancy, criminal abortion, and operations during pregnancy.

On the part of the fetus itself, conditions may develop which result in antenatal death, such as hydramnios, or pathological changes developing in the chorion, blood vessels of the endometrium, or the presence of a uterine mole.

Mechanical factors on the part of the fetus are malposition and malpresentation, malformation, and a relatively large child.

PREMATURITY.—Prematurity is largely the result of conditions which cause ill health of the child and early delivery. It has been estimated that about sixty per cent of all children born prematurely die within the first twenty-four hours, and these constitute about ten

per cent of all antenatal deaths. While pneumonia as a germ disease does not in itself infect the child, it may yet cause its death by dyspnea, the result of absorption of toxic products from its mother's blood.

GONORRHEA.—The effect of gonorrhea is usually only local, and it cannot be considered as an important factor in the causation of abortion, except in the presence of an acute attack in the very early weeks of pregnancy.

HEMORRHAGE.—Accidental hemorrhage, generally due to premature separation of the placenta, always causes fetal death and very often kills the mother as well.

Bleeding from the uterus in the early months of pregnancy may be due to various causes and is not at all uncommon. In many of these cases the bleeding eventually subsides without causing the death of the fetus, but in a certain number the pregnancy terminates as a direct result of interference with its nutrition.

Apoplexy of the placenta may cause antepartum hemorrhage and a stillborn child.

Percentage of Prematurity.—There has come from the University of California Hospital a very interesting report by McQuarrie, based upon a series of 2717 deliveries. Reckoning from the period of possible viability at the thirtieth week to twelve hours after delivery, he found that there were ninety-seven fetal deaths, which gave a fetal mortality of 3.6 per cent. There were twenty-two cases of fetal death occurring before the age of viability during the fifth and sixth months, which brought the total deaths up to 119, a percentage of 4.4. In his report he makes the following tabulation:

CAUSES AND PERIODS OF FETAL DEATHS

Cause	Under 30 Weeks	Over 30 Weeks	Percentage
Syphilis	0	15	15.5
Unknown	5	17	17.5
Birth trauma	0	36	37.1
Toxemia	4	9	9.2
Fetal abnormality	1	8	8.2
Prematurity	2	5	5.3
Placenta previa	2	2	2.0
Various	8	5	5.2
	22	97	100.0

In the group of cases where syphilis was a cause, there were fifteen cases in all. The diagnosis was made in every instance by

a Wassermann test, and all of the mothers had antisyphilitic treatment during pregnancy.

Cases where the cause of death was put down as "Unknown" numbered seventeen, and of these ten of the infants were born macerated. Sufficient evidence could not be found at necropsy to make a definite diagnosis of syphilis, although it was considered that about eighty per cent of these cases were in reality syphilitic.

Premature birth is of fairly frequent occurrence, but there is a wide variation in published reports on this point. For instance, the Rotunda Hospital gives only one to two per cent, while the Vienna Clinic places it at thirty-five per cent, and the Paris Maternity returns twenty per cent. When we come to a study of the mortality rate in premature children we will find the important fact quite evident—that prematurity is a common cause of stillbirth and infantile death, and as such has a more or less direct bearing on sterility. The nearer the labor to term, the better the prospect for the child. The more frequent causes of premature birth are antepartum hemorrhage, toxemia, undue physical effort or mental strain on the mother's part, or malnutrition or morbidity of the child.

Every once in a while a case will be met with where for no discoverable cause the woman repeatedly starts labor prematurely, and the baby is either stillborn or dies shortly after birth, yet without any pathology to account for its death. The appropriate treatment for such cases is to stave off the premature onset of labor and carry the woman to term. When this can be accomplished the child usually survives. The following case is illustrative of this curious phenomenon:

Mrs. E. S., twenty-seven years of age, married six years, during which time she had given birth to four children. The first child, weighing nine pounds, born spontaneously at term after a five-hour labor, is alive and well. With the second pregnancy, labor began from two to three weeks early and terminated after two hours in the birth of a baby which appeared healthy but lived only one hour. With the third pregnancy labor started three weeks early, lasted nine hours and terminated in the birth of an apparently healthy child which lived only one hour. With the fourth pregnancy, labor again started two weeks early, lasting nine hours, and a healthy nine-pound baby was born. This also died at the end of an hour. No cause for death could be found with any of these children. The mother and father were both in perfect health.

I saw the patient for the first time with her fifth pregnancy when she was in her seventh month, and had her under constant observation from that time on, her condition remaining perfectly normal. Two weeks before her expected date of

labor, she began to have strong uterine contractions coming on regularly every fifteen to twenty minutes. Opium was administered to the point where the contractions were lessened, and at the end of twelve hours they ceased entirely. The cervix, which had dilated up to two fingers, closed down again to one finger. One week after this the same symptoms appeared, contractions being strong and regular. The cervix this time dilated to three fingers. The pains were again controlled by opium, as in the first instance, and finally subsided, the cervix contracting down to one finger. One week later labor again started and was allowed to progress without interference. At the end of three hours a normal eight-pound, ten-ounce, healthy living child was born.

The frequency with which still-births or the birth of children who live only a short time thereafter still takes place calls loudly for better medical care of the mother before as well as during her confinement. It is not fair to her that she should be called upon to undergo all the trials and dangers incident to pregnancy and child bearing only to lose her baby before or shortly after it is born. The great value of antenatal treatment cannot be over-estimated.

Accidents of Childbirth.—A certain number of fetal deaths, the result of accident, cannot be avoided, such as are those due to apoplexy of the placenta, knotting of the cord, breech presentation, premature rupture of the membranes, and various injuries to the mother. Extremes of youth or old age in the parents and chronic diseases are predisposing causes. While syphilis is the cause of a large proportion of stillbirths, it is a preventable one in many. I do not believe that it should be held responsible for the overwhelming majority. It is time that a fair share of the blame was placed where it belongs—on the shoulders of incompetent obstetrics. Until this is done and we demand for our women the same amount of surgical skill at obstetrical operations as is accorded them at other major surgical operations, the great number of children who die before they ever see the light of day, or shortly thereafter, will still continue to disgrace the annals of medicine.

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CHAPTER XXII

PESSARY TREATMENT OF RETRODISPLACEMENTS IN STERILITY

Postpartum retrodisplacement—Technique—Types of pessary—Function of pessary.

With the rapid development of gynecological surgery during the past decade or so the pessary treatment of displacements has been to a great extent laid aside and by many entirely forgotten. It is unfortunate that such should have been the case, because the pessary is of great value. It is not my purpose in this chapter to discuss at any considerable length the various uses of the pessary, but only to take up briefly its use in cases of retrodisplacement affecting the fecundity of the patient. In postpartum retrodisplacement, we find its field of greatest usefulness, and there are very few of these cases which cannot be cured by its proper use. Whereas the proper fitting of a pessary in a difficult case requires considerable experience and practice, its introduction in the great majority of cases is comparatively simple. The pessary, when properly fitted, often effects a cure; when improperly fitted, never effects a cure. Before any attempt is made to introduce the pessary the uterus should be replaced and the presence of adnexal disease ruled out. Such involvement is usually a contra-indication to the use of the pessary. Of the various means of effecting replacement of the uterus, some are applicable to certain cases which would be useless in others.

Postpartum Retrodisplacement.—When the displacement is a postpartum one, diagnosed shortly after delivery, much may be accomplished by postural treatment, that is, by having the patient assume the knee-chest position for fifteen minutes several times a day; whenever lying down, an extreme Sims, or face position, should be taken. It is a great mistake to allow these cases to lie on their backs. The advice often given to cases of threatened abortion to go to bed and lie flat on their back until the symptoms subside is most pernicious, for in many of these the threatened

abortion is due to a retrodisplacement which the dorsal position only helps to maintain and increase. "He who cures a disease may be the skillfulest, but he who prevents it is the safest physician," says the old proverb.

When the knee-chest position is prescribed, the patient should be shown how to separate the labia widely to allow the air to enter and distend the vagina. This is an important adjunct in helping to gravitate the fundus forward. In a vagina thus ballooned out by the in-rushing air, the anterior vaginal wall draws on the cervix and the distention of the cul-de-sac dislodges the fundus, which then drops forward into position. As the fundus is yet large and soft, the angle of flexion at the cervix straightens out and the fundus swings forward into normal anteversion. The patient can then lower herself, lying on her face, and should maintain for some time this face position, relieved occasionally by the extreme
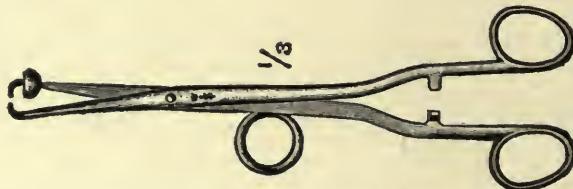
FIG. 18.—AUTHOR'S UTERINE REPOSITOR.

lateral or Sims position. These are the only two reclining positions she should ever thereafter assume in bed. If this simple procedure is not sufficient to dislodge the retroflexed fundus, then with the patient in the knee-chest position the physician passes the index finger high up in the cul-de-sac and dislodges the fundus from the hollow of the sacrum. If this should be unsuccessful, through inability to reach high enough with the finger, a sponge holder or dressing forceps armed with a small ball of cotton may be used as a lever. Any great degree of force during this procedure is unnecessary and should never be attempted. In conjunction with the above method, traction on the anterior lip of the cervix by means of a tenaculum forceps is often of help. If the patient is an ambulatory one, or is ready to get out of bed, then it is wiser to introduce a pessary while she is still in the knee-chest position, allowing her then to turn over on her back for a re-examination to make sure the fundus is held in place. When the uterus has been replaced and a proper pessary fitted, there is

little chance of a recurrence so long as the pessary is worn.   In cases where the displacement existed before the pregnancy or followed a previous delivery, the pessary should be introduced as a prophylactic measure, even though the uterus is found in normal position. If the postural treatment carried out in this way, assisted by the manipulations above described, is not sufficient to enable one to effect a reposition, then recourse should be had to the bimanual method of replacement.   This method is of value in those cases where the displacement has existed for some length of time and the uterus is small, in other words, the chronic retro-displacements.   The technic of this method of reduction is as follows.

Technic.—The patient is placed in the dorsal position, preferably upon an examining table rather than a bed.   The vagina is then opened with a Sims speculum, the anterior vaginal wall elevated in order to disclose the cervix, and its anterior lip then grasped and drawn down.   In replacing many retroversions and retroflexions, downward traction on the cervix and its satisfactory control throughout the manipulation are of the utmost importance.   For this purpose the ordinary traction forceps generally used, though in most cases a very efficient instrument, is, nevertheless, lacking in some important respects.   These I have endeavored to supply in the repositor shown on page 162.   This has helped me very materially in this work, and in difficult cases has many times proved itself invaluable.

The Sims speculum is now withdrawn and moderate traction made on the cervix in the line of axis of the vagina.   This should not be sufficiently strong to cause the patient any pain, and should be persisted in for a few moments, when the uterine supports will gradually relax, enabling the cervix to be drawn well down to the vaginal outlet.   This procedure is of value in helping to straighten out the angle of flexion and will often convert a retroflexion into a retroversion.   The index finger of the disengaged hand is now introduced high up in the cul-de-sac, or better yet in the rectum, so that its terminal digit, slightly flexed, lies behind the uterus a little above the internal os, against which it presses, acting as a fulcrum.   By means of this repositor the cervix is now pushed backwards and upwards into the hollow of the sacrum, when the fundus will usually swing forward into an anterior position.   In executing this maneuver, the button on the anterior jaw of the
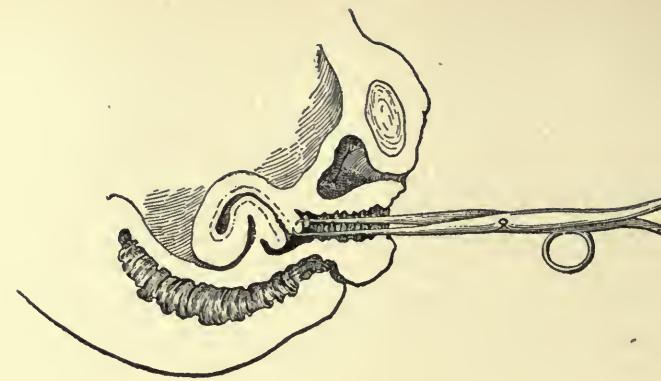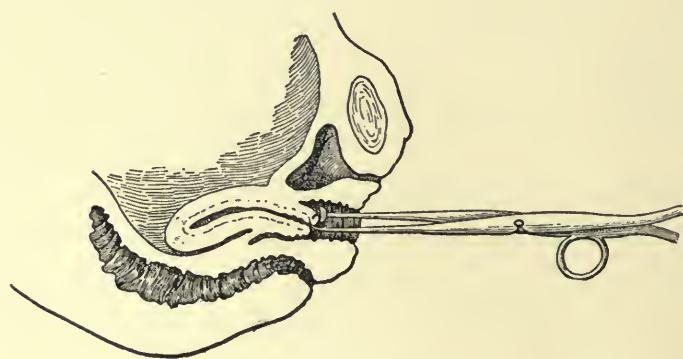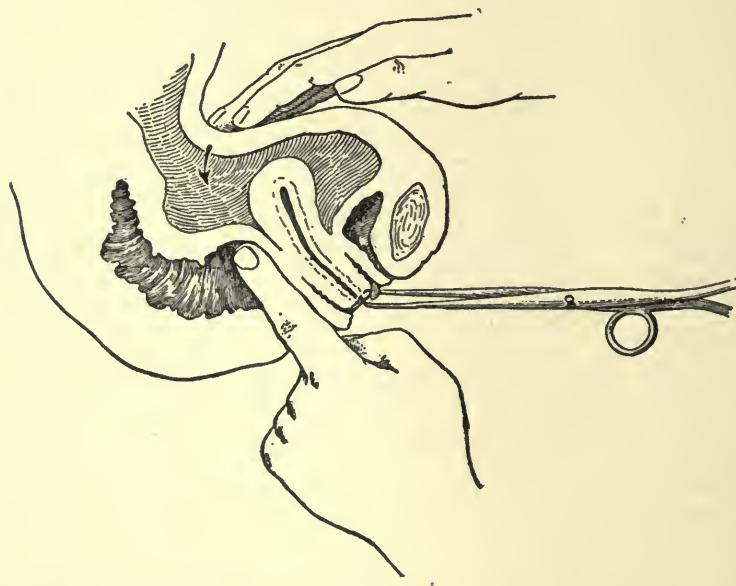
FIG. 19.—MANUAL REPLACEMENT OF RETROFLEXED UTERUS.   1, first step.   2, second
step.   3, final step.

repositor impinges against the anterior cervical lip, preventing
the arm of the instrument from pushing through the cervix, often
a troublesome happening when an ordinary pair of tenaculum
forceps is used.   The thumb belonging to the hand whose index
finger has been used as a fulcrum is then passed through the ring
on the repositor attached to its under arm, and holds both cervix
and repositor in position, thus releasing the other hand to be used
on the abdomen when necessary in assisting the fundus forward.
After the replacement has been accomplished, the vaginal finger,
in conjunction with, the abdominal hand placed over the fundus,
by more or less considerable pressure, bends the cervix and fundus
together, thus producing a marked anteflexion, which later
recedes to a normal anteversion.   Occasionally in extreme retro-
flexion it will be found that the fundus has passed between the
utero-sacral ligaments which, closing over it anteriorly, interfere

FIG. 20.—SMITH RETROFLEXION PESSARY.

with or may prevent its replacement by the above method.   In
such cases the rectal finger presses against one of the uterosacral
ligaments, pushing it far enough to the side to release the fundus,
or release may be effected by manipulations with the abdominal
hand alone, when the wall is thin and relaxed.   Now with the
abdominal hand placed over and back of the fundus, the uterus is
held firmly forward against the symphysis, while the free hand
releases the repositor and inserts the pessary.

The success of this method just outlined above depends upon
more or less extreme relaxation of the abdominal wall, secured by
an intelligent coöperation on the part of the patient or, when
necessary, by the administration of an anesthetic.   Without an
anesthetic great gentleness is necessary throughout, for if the
patient is hurt her coöperation is usually lost and the reposition
becomes difficult or impossible.   The choice of the pessary to be
used depends upon the individual requirements of the case.   The
size of the vagina, its length, and breadth should be carefully
taken into consideration when making a selection.   A large, sub-
involuted vagina will require a large pessary at first, which later

can be replaced by a smaller one. In recent postpartum displace-
ments the first pessary used should be considerably larger than
the one which will ultimately be used a few weeks later.

Types of Pessary.—As involution progresses pessaries of a
smaller size can be progressively substituted. A short, broad
vagina requires a short, broad pessary, whereas a long, narrow
vagina requires one of corresponding length and narrowness. If
a pessary long enough for the case is not broad enough to stay in
place, then a size larger pessary may be shortened by immersing
in boiling water for a few moments and when it has softened
sufficiently, pressing the ends together. Likewise when the pes-
sary is too broad, but not sufficiently long, it can be made suitable
by pressing the sides together instead of the ends. These are
about the only changes that need to be made in the stock pes-
saries, and they are not often found necessary.

The Albert Smith retroversion pessary I prefer to all others.
Sizes from three and a half inches in length up will be found the
most suitable. Having selected the pessary that seems most likely
to suit the case, the index finger is introduced into the vagina and
retracts the perineum. The larger end of the pessary is then
introduced first. It should be borne in mind in introducing the
pessary that the diameter of the introitus is vertical or antero-
posterior, so that as the pessary passes over the perineum it must
lie on its side. The vagina, however, is normally a collapsed tube
with its largest diameter transverse, and, therefore, as the pessary
enters the vagina it must rotate, so as to eventually lie with its
lateral or transverse diameter corresponding to the transverse
diameter of the vagina. After the pessary is introduced at the
outlet, and when about one-half of it has passed over the peri-
neum, it will then act as its own perineal retractor, and the finger
which has been used for this purpose can be released and passed
upwards until it rests against the concave bend of the greater bow.
Upward and backward pressure with the index finger at this point
on the pessary and in the direction of the cul-de-sac carries the
larger end of the pessary directly backwards into the hollow of
the sacrum behind the cervix. When this maneuver is properly
carried out, no especial attempt need be made in any other way
to guide the pessary into place, for it will rotate into the lateral
diameter of the vagina of its own accord; it being only necessary
to see that it rotates with the curve of the upper or larger end,

anterior and not posterior. Occasionally in spite of this precau-
tion it will turn turtle, with the curve of the upper end posterior,
so that a final examination should always be made to determine
that it lies in its correct position before the patient is allowed to
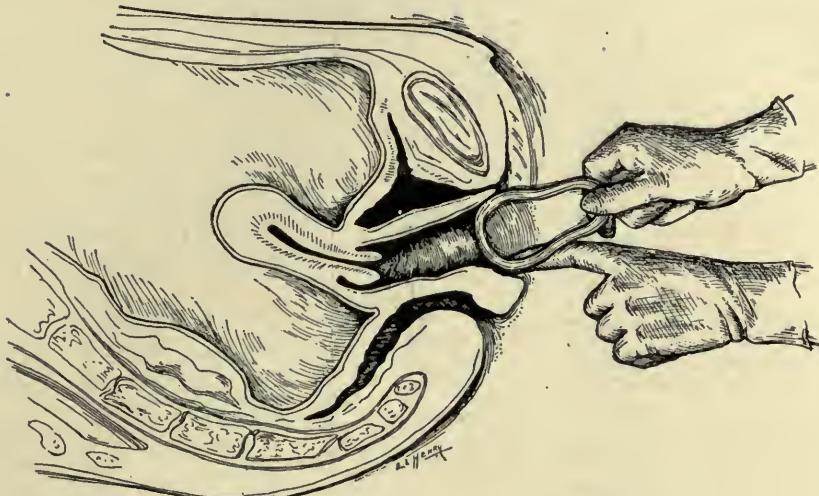
FIG. 21.—INTRODUCTION OF PESSARY: FIRST STEP.
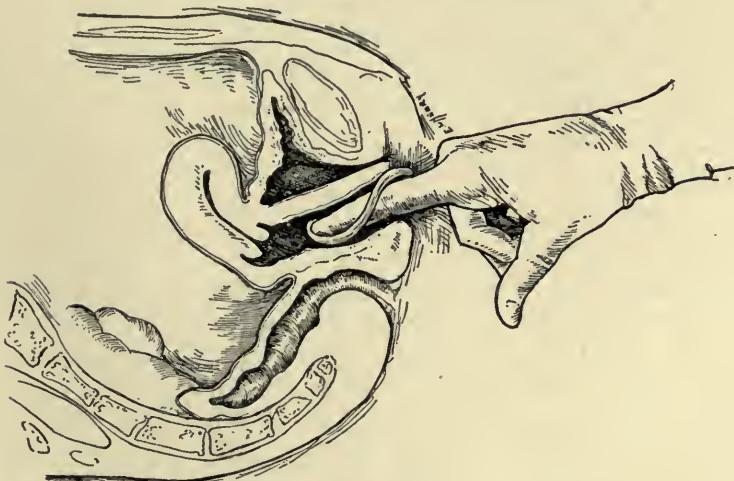
FIG. 22.—INTRODUCTION OF PESSARY; SECOND STEP.

leave the table. Both hands can now be released and the labia
separated sufficiently to allow a thorough inspection when the
lower or smaller end of the pessary should be seen or felt to lie
just under the symphysis. This should not press against the sym-

physis strongly enough to obstruct the urethra or cause pain or
discomfort in any way. When there is extreme relaxation of the
vagina and perineum the pessary may not be retained in place
unless the perineum and vagina have been first repaired. Marked
adnexal disease is a contra-indication to the use of the pessary.
In the congenital displacements, those with a short anterior
vaginal wall, it will never effect a cure unless the short anterior
wall is lengthened as a preliminary procedure.

A properly fitted pessary may be worn indefinitely without
causing the patient annoyance or interfering in any way with her
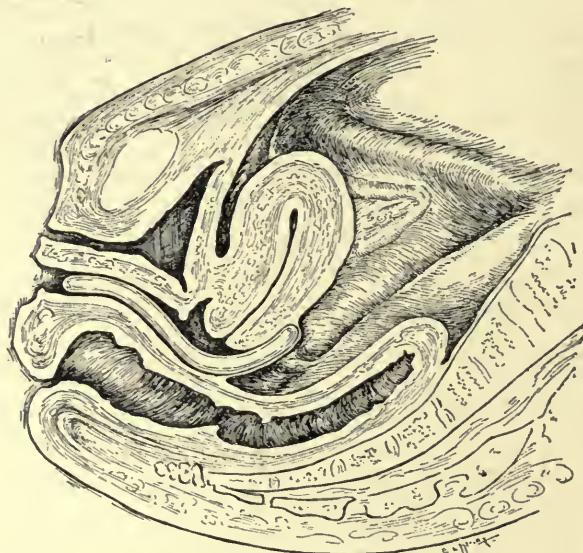
FIG. 23.—PESSARY IN PLACE.

marital relations. After replacement, examination should be
made at the end of a week, then two weeks, three weeks, and
four weeks, and thereafter once every month to make sure that
the uterus stays in place and that the pessary fits properly. The
pessary should be removed and the vagina examined for any
evidence of erosion at two-month intervals.

FUNCTION OF PESSARY.—To sum up, the function of the pessary
is to hold the cervix up in position, thus relieving the tension on the
overstretched utero-sacral ligaments and giving them, in common with
the round ligaments, also relieved of undue tension by replacement of
the fundus, a chance to regain their supporting power. The uterus
after replacement soon regains its normal tone.

CHAPTER XXIII

OPERATIVE TECHNIC

Enlarging the introitus vaginalis—Dilatation of the cervix—Curettage—Enlarging the external os—Cervical repair—Lengthening of the anterior vaginal wall and uterovesical ligament—Abdominal incision—Advantages of author's abdominal incision—Retrodisplacement, surgical measures—Myomectomy—Operation for tubal occlusion.

Enlarging the Introitus Vaginalis.—In cases of vaginismus or where dyspareunia is caused by too small an opening, median or
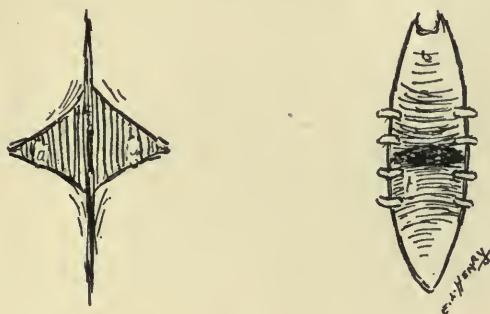
Fig. 24.—Enlarging Introitus. a–a., lateral incisions. b., incisions sutured with enlarged vaginal opening.

lateral episeotomy is to be performed. My choice is for two lateral incisions. These are from one to one and a half inches in length, made directly outward through the vaginal constrictor muscle, and sewed up in the opposite direction from which they are made with four to six interrupted sutures of chromic catgut.

Dilatation of the Cervix.—A stout traction forceps grasps the anterior lip and draws the cervix down within easy access of the operator. The uterine sound is then passed as far as the cavity of the uterus to determine the direction and length of the cervical canal, as well as the size of the internal os. Frequently the internal os will be found so small or so tightly closed that considerable difficulty is met with in passing the sound. In such

cases gentle but firm pressure is made against it with the tip of the sound until it yields. When a greater degree of force becomes necessary the sound, as it is introduced, should hug the roof of the cervical canal until it has passed the internal os. By this procedure puncture of the cervical uterine segment will be avoided, as it is posteriorly that the stenosis is most marked, often by a well-developed fibrous septum. If too great pressure is made

FIG. 25.—HENROTIN'S TRACTION FORCEPS.

against this it may deflect the end of the sound against the softer, less resistant muscular tissues of the cervix, which it easily penetrates, creating a false passage between the folds of the broad ligament, or even into the peritoneal cavity. When the internal os is not readily located, the sound should be rotated several times around its axis, maintaining gentle but firm pressure meanwhile against the internal os, when it will ultimately find its own way through.

FIG. 26.—MARTIN'S UTERINE SOUND.

Having, with the sound, determined the course of the cervical canal and the size of the internal os, the next step is the dilatation. At the beginning of this operation, the slender, rather pointed Wylie's dilator is often necessary and should always be at hand, as in cases of marked stenosis of the internal os it is next to impossible to accomplish the dilatation with any other instrument unless it be with the old-fashioned graduated tubular dilators, which are cumbersome, unsatisfactory, and at times dan-

gerous. In introducing the dilator, the same technic should be carried out as above described for the introduction of the sound, otherwise the cervix may be perforated and the broad ligament or peritoneal cavity entered instead of the uterine cavity.

When the blades of the dilator have passed the internal os, the dilatation is begun by the gentlest of pressure. During this pro-
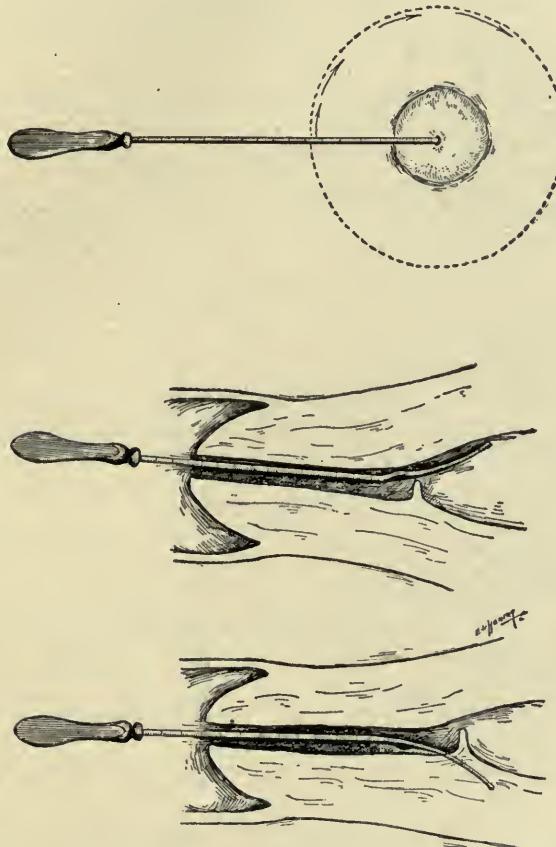
FIG. 27.—INTRODUCTION OF THE UTERINE SOUND IN STENOSIS OF THE INTERNAL OS.

ceedure all pull on the traction forceps should cease while the cervix on the dilator is pushed up as far as it will go. The vagina is thus put on the stretch, preventing the cervix from jumping off of the blades of the dilator as the dilatation progresses. This maneuver, shown me many years ago by Dr. J. Riddle Goffe, if adopted will save many an accidental laceration of the cervix that frequently occurs with the use of the Goodell dilator. This instru-

ment, although in almost universal use, is most unsafe, for its complicated mechanism, designed to give a parallel separation of the dilating blades, is weak, and when the cervix is at all resistant they separate more widely at the external than at the internal os, assuming the shape of a wedge. If the cervix is held down near the outlet during the dilatation and the traction forceps tears out, as it quite often does, the cervix is then forced off of the dilator when the blades, under considerable tension by reason of the ten-
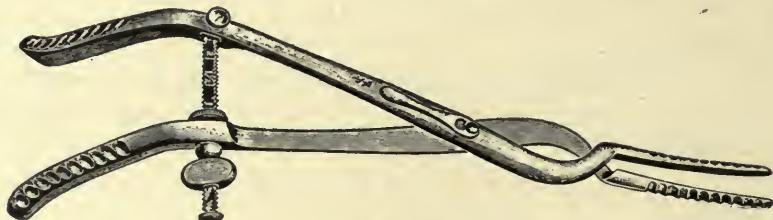
Wathen Dilator.

Sims Wylie Dilator.
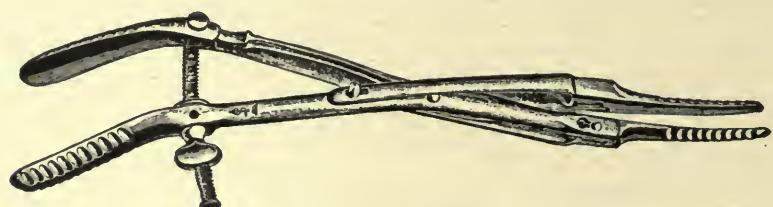
Goodell Dilator.
FIG. 28.—CERVICAL DILATORS.

sion screw, spring widely apart, often tearing the cervix well up into the broad ligament. I have seen a number of cases where this accident has happened that were brought into the hospital in extremis from hemorrhage.

After the dilatation is well started with the Sims dilator, a stronger instrument, such as the Wathen, which is much to be preferred to the Goodell, can be then substituted with advantage. The process of dilatation should be a slow and careful one, fifteen to twenty minutes being none too long in many cases, and the

pressure used should be continuous and not intermittent, for only in this way can a thorough paralyzation of the cervix be obtained, and paralyzation is very necessary if the uterus is to be curetted and packed. When there is a marked degree of stenosis of the internal os, the obstructing septum should be incised posteriorly, but never anteriorly or laterally, because of the danger of injuring the bladder or uterine arteries.

Curettage.—When dilatation has been completed and the cervix thoroughly paralyzed, the curettage is started. This is best done with a sharp curette, one of as large size as can be readily introduced. With great gentleness the instrument is carried to the fundus and the removal of the endometrium begun by a firm downward stroke as far as the internal os. As the os is reached all pressure on the instrument ceases and it is again carried carefully to the fundus and the down stroke repeated. This is continued until the entire uterine cavity has been thoroughly gone over. While the uterus is being curetted strong downward traction on the cervix should be kept up, as this not only steadies the organ but also helps to straighten out any anteflexion present, so that the anterior surface of the cavity can be more easily reached. When the anteflexion is extreme it will be found that the handle of the curette cannot be depressed sufficiently to bring the cutting end of the instrument in contact with the anterior surface of the cavity unless the weighted speculum is removed. This point is worth remembering, and I have never seen it mentioned in descriptions of the operation.

Upon finishing the curettage, the cavity is irrigated with a normal saline solution and either packed or not as the indications may call for. When packing is used, my preference is for ten-percent iodoform gauze. This should be introduced by carrying the end of the strip well up to one horn of the cavity and then packing across from side to side until the entire uterine cavity is tightly filled. As the cervix is reached, the packing ceases and the strip of gauze is brought out straight through the cervix, vagina, and introitus, so as to be in contact with the vulvar pad. This latter should be kept wet to facilitate capillary drainage. At the end of three days the packing is removed and a vaginal douche given.

Enlarging the External Os.—Small traction forceps grasp the anterior and posterior lips of the cervix, which is drawn down within easy reach of the operator and there held by an assistant.

Lateral incisions one-half inch in length are then made from the os outward on either side.

These incisions are then sutured with two or three interrupted stitches of chromic catgut introduced so as to close them in the opposite direction to which they were made.
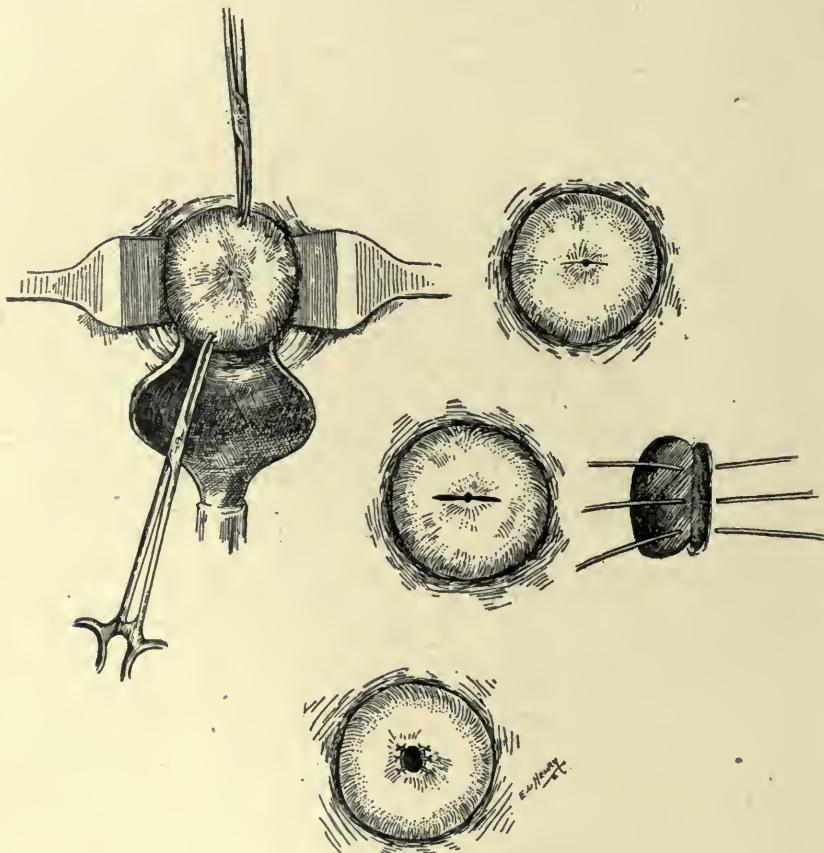
FIG. 29.—OPERATION FOR PINHOLE OS, EXLARGING THE EXTERNAL OS.

By this operation the opening of the external os is increased to normal size. A small strip of gauze is introduced into the cervix as far as the internal os and removed on the third day.

Cervical Repair.—While the majority of cervical lacerations will be found to be bilateral and to call for the repair of both sides of the cervix, a certain number involve only one side, and in these a unilateral repair is all that is indicated. When the tear is unilateral it will most frequently be found on the left side and is often

quite extensive. This is the type of laceration most liable to
involve the internal os. When this has occurred the tear not
infrequently extends out into the vagina, perimetrium, and broad
ligament. Its resulting scar can be easily traced with the finger
The vaginal covering of the cervix will often unite spontaneously
in such cases, while the cervical tissue proper remains widely sep-
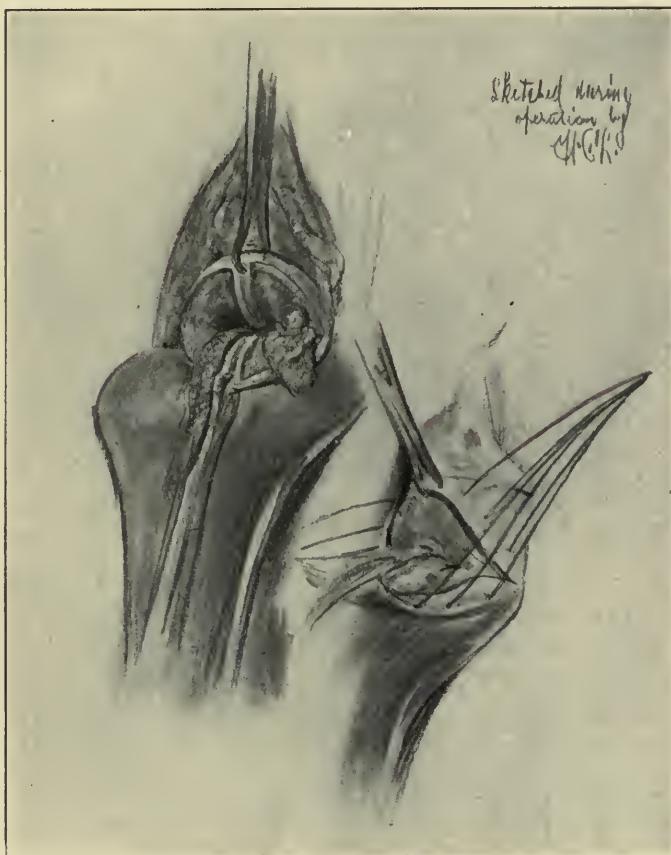
FIG. 30.—CERVICAL REPAIR. a., bilateral denudation. b., method of introducing
sutures

arated. The eye alone cannot always detect the full extent of the
cervical injury and should not be depended upon, for with the
uterine sound it is quite easy to make a correct diagnosis of the
condition of the internal os, even though the external os may have
healed to normal size and appearance.

In performing cervical repair, each lip of the cervix is grasped
with a pair of tenaculum forceps and drawn down within easy

reach.   In some cases this may be more or less interfered with by
the restricted mobility of the uterus from adhesions or cicatricial
contraction of the broad ligaments and vaginal vault.   These are
difficult cases to operate upon at the best and require great care
and patience.

It is necessary in some, and advisable in most, cases of cervical
repair to do a preliminary dilatation.   With the knife, scissors, or
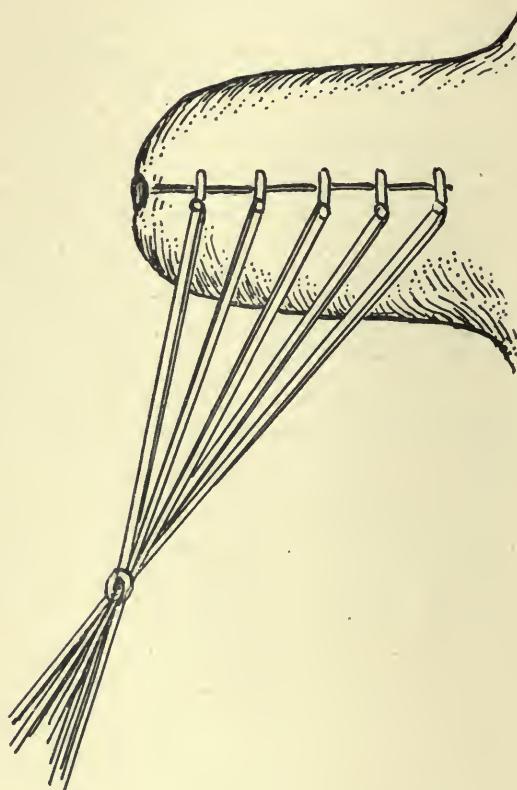
FIG. 31.—CERVICAL REPAIR.—Sutures tied

both, the scar tissue is now removed from the cervical angles,
together with any adjacent enlarged, infected glands.   A strip
of mucosa one-quarter of an inch wide is left on either lip to line
the new cervical canal.   The sutures of silkworm gut or chromic
catgut are now introduced, the first one in the angle requiring
special care.

Before passing this angle stitch the cervical tissue is caught
high up in the angle at *a* with a small pair of tenaculum forceps

and held firmly down while the suture is introduced. The muscular tissue of the cervix should be distinguished from the overlying, soft, sliding tissue of its vaginal aspect, which latter is only too often the sole tissue caught in the first stitch or two, the cervix being entirely missed. All the sutures are now taken before any are tied. If this plan is not adopted, each one tied constricts the field of operation, making the introduction of each succeeding one progressively more difficult, and, furthermore,
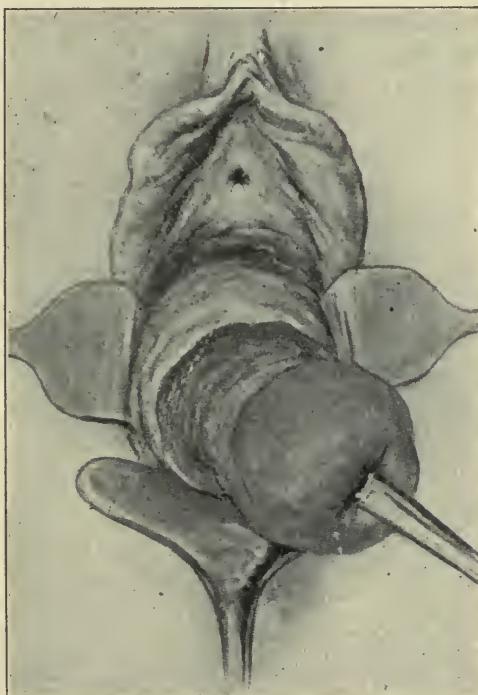
FIG. 32.—CERVICAL AMPUTATION. First step, cervix drawn down and circular incision made separating the vagina at its point of contact.

allows of the formation of blood clots in the wound that have to be absorbed before union between the flaps can take place. This very materially interferes with prompt and firm healing.

After the sutures have all been placed, and the field cleared of clots, they are tied just tight enough to snugly approximate the tissues, but not so tight as to cause undue constriction, as this leads many times to pressure atrophy and even necrosis.

If silkworm gut has been used as the suture material, the ends are left long and all tied together to facilitate their later removal.

These sutures are then taken out on the fourteenth day by placing the patient in the knee-chest position, retracting the perineum with a Sims speculum, grasping the knotted bunch of suture ends and drawing the cervix down so that the sutures may be easily cut and removed one by one. As the last suture is cut, the cervix is automatically released and drops back into place.
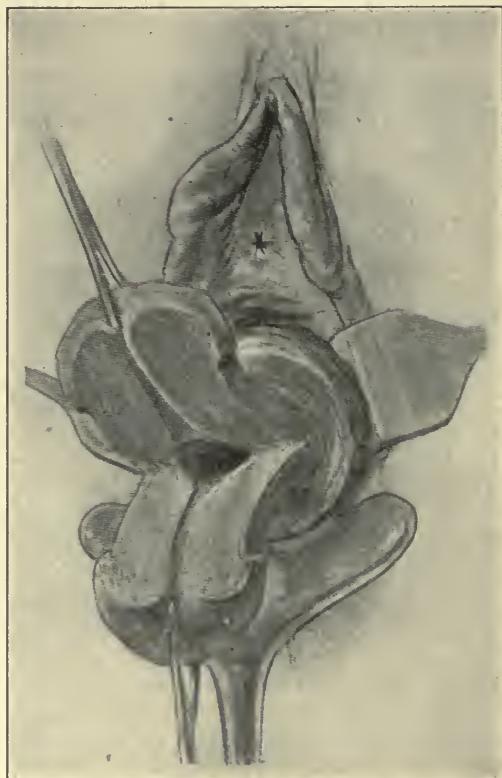
FIG. 33.—CERVICAL AMPUTATION.   Second step.

Cervical Amputation.—With a small traction forceps on either lip, the cervix is drawn strongly down and held firmly in position. A circular incision with the knife separates the vagina from the cervix at its point of attachment, and by blunt dissection the cervix is freed from the surrounding tissues. During this dissection pressure should always be directed against the cervix to avoid injury to the bladder in front or the rectum behind. At either side, where the vessels from the broad ligament enter the cervix, the tissues should be ligated with catgut close to the cervix and

then cut. When the desired length of cervix has been bared, amputation by transverse incision is performed. The anterior and posterior vaginal flaps are now sewed to the cervical stump in such a manner as to cover its raw surface, leaving the cervical canal patent and approximating vaginal and cervical mucosa at the new external os. Deep sutures of silkworm gut or chromic gut should be used for attaching the vagina to the cervix, and
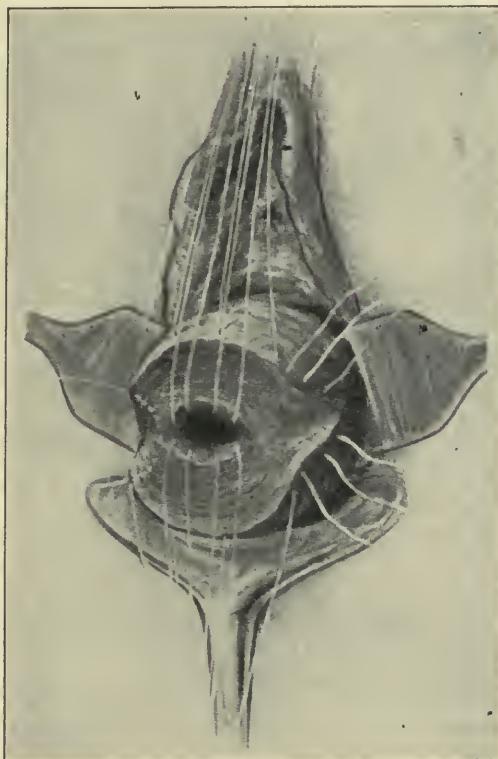
FIG. 34.—CERVICAL AMPUTATION COMPLETED. Sutures introduced and ready to tie.

plain catgut for accurate superficial approximation. If silkworm gut is used as suture material the stitches should not be removed before the end of the second week.

Lengthening of the Anterior Vaginal Wall and Uterovesical Ligament.—This operation, quite easy of accomplishment, is of extreme importance in the congenital type of retrodisplacement, where the short anterior vaginal wall and a low attachment of the uterovesical ligament hold the cervix forward in the axis of the vagina, so that even when the fundus is brought forward the

cervix is prevented from swinging back into the hollow of the sacrum perpendicular to the axis of the vagina, its normal position.

A transverse incision, one inch to one and one-half inches in length is made through the anterior vaginal wall, at the point of
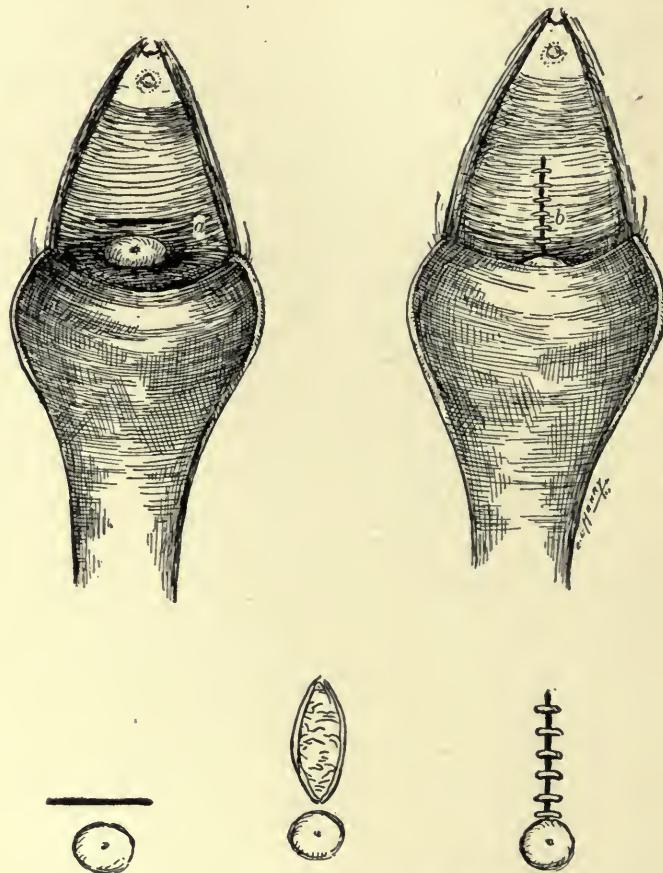
FIG. 35.—LENGTHENING OF THE ANTERIOR VAGINAL WALL AND UTEROVESICAL LIGA-
MENT.   a., line of incision.   b., after sutures are passed.

its attachment to the vaginal aspect of the cervix. This point is easily determined by first pulling the cervix down and then pushing it up, a procedure which discloses the fold of the anterior vaginal wall on the cervix, the proper point at which to make the incision. The incision is now carried through the vaginal wall and the uterovesical ligament is dissected out and cut from its uterine attachment. If the cervix be now pushed strongly back

towards the hollow of the sacrum, the uterovesical ligament will be seen to ride up on the uterus from half an inch to an inch above its severed attachment. The anterior vaginal wall will lengthen out as the transverse incision is converted into an anterior posterior one. Thus it will be seen that the cervix can now be carried well back into the hollow of the sacrum where it will remain without any undue tension of the anterior vaginal wall to pull it forward.

The uterovesical ligament is now sutured with several chromic gut sutures to the uterus at a point one-half an inch or an inch higher than its original attachment, and the incision in the vagina is sutured so as to convert the original transverse incision into a longitudinal one, thus lengthening out the entire vaginal wall at its cervical attachment by the length of the incision originally made. Occasionally the uterovesical ligament will be found to be quite short and the bladder attached quite low down on the cervix. In these cases the bladder should be freed from the uterus sufficiently to allow the cervix to go well back into the hollow of the sacrum, without any undue traction on the bladder itself. When this operation is completed, a suitable pessary should be introduced to hold the fundus forward, and a light vaginal pack against the cervix to control any slight oozing. This packing should be removed on the third day, and no vaginal douches given until after the tenth day. Douches should never be given very hot in pessary cases.

ABDOMINAL INCISION.—In approaching the pelvic organs in the female for the purpose of surgical treatment, the incision used should possess numerous features advantageous alike to both operator and patient.

To overcome two great objections to the median-line incision— shock and postoperative hernia—the vaginal incision was devised and extensively practiced. This incision, while greatly minimizing the amount of shock and practically abolishing postoperative hernia, had the additional advantage of affording more direct access to the field of operation. It enjoyed well-deserved popularity, but that it had its limitations was soon evident. At the Second International Congress for Gynecology and Obstetrics, held at Geneva in 1896, Küstner presented a new method of opening the abdomen in place of the median-line incision. The cut was made in the region of the suprapubic hair in a transverse direction through the skin and subcuticular tissue, the

fascia and peritoneum being incised vertically in the median line. He advocated this modification because of the objection on the part of the laity to the deformity caused by an ugly median-line scar, and recommended it for simple cases, such as the separation of adhesions and ventral fixation.

At the same congress Rapin presented his incision, the technic of which was identical in all respects with the one described by Küstner. In 1900, four years later, Pfannenstiel modified these by incising the fascia likewise in a transverse direction, separating it above and below from the underlying muscles and entering the peritoneal cavity by a vertical incision through the linea alba and peritoneum. Aside from a mere cosmetic standpoint, his modification was of great importance, for it was designed to abolish that "bugbear" of all abdominal surgeons—postoperative hernia.

The principal difference between the Küstner-Rapin incision and that of Pfannenstiel is that in the latter the fascia, being incised transversely, is left completely intact over the vertical incision in the linea alba, and the unfavorable tension exerted by the transverse and oblique muscles of the abdomen on the fascial scar in the median-line incision is disposed of. Pfannenstiel hoped that this incision would afford absolute protection from postoperative hernia. I believe I do not exaggerate when I say that his dream has been fully realized. To him belongs the honor of being the first to plan, execute, and publish the transverse fascial incision, which had been independently practiced, however, by both Stimson of New York and Hartman of Paris. The Pfannenstiel incision overcame many of the objections to both the median-line and vaginal incisions, and its many advantages were so apparent that it met with immediate and almost universal favor. An extensive trial of this incision has led me to make certain modifications and changes in his technic which I believe better meet the requirements of the average case. It is because of these rather radical changes that I give a detailed description of the incision as I make it.

TECHNIC

With the patient in the Trendelenburg position (45° elevation), a transverse incision 2 to 4 inches in length is made in the edge of the suprapubic hair, or in the transverse skin fold usually found just above it. A straight cut is used rather than a semilunar one, because experience has shown that it severs fewer blood-vessels, giving rise to
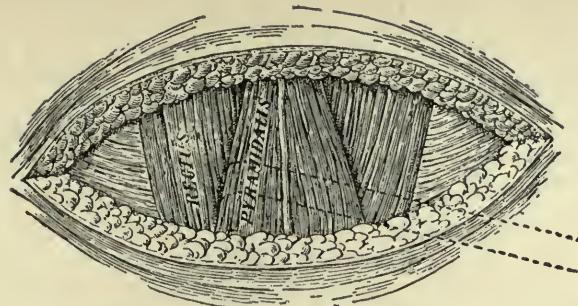
1. The transverse incision, with the pyramidal and the abdominal recti muscles exposed.
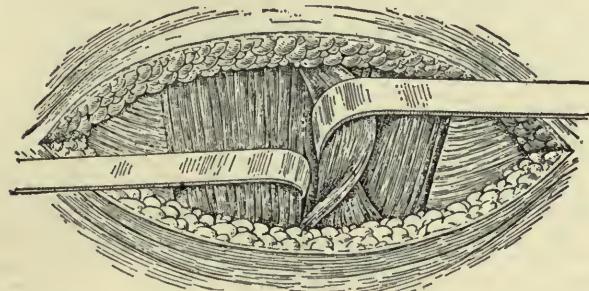
2. The right pyramidalis drawn aside and the recti separated.
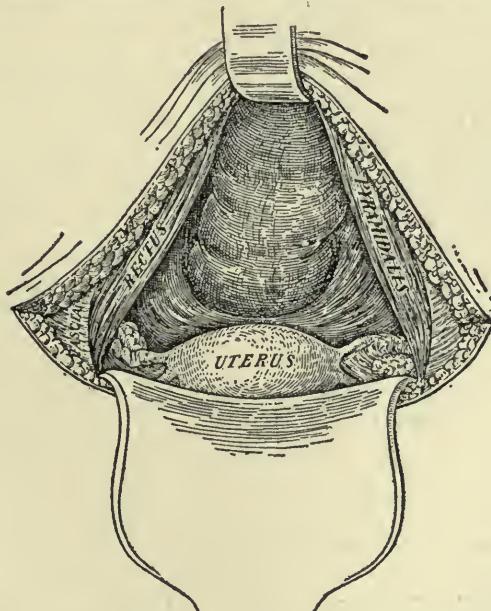
3. The incision and separation of the muscles and fascia completed, with the pelvic cavity and organs exposed.

FIG. 36.—AUTHOR'S TRANSVERSE SUPRAPUBIC ABDOMINAL INCISION.

less hemorrhage and causing less interference with the subsequent nutrition of the flaps. It is seldom necessary to ligate more than two or three blood vessels in the wound, and often no ligatures at all are needed, thus greatly reducing the amount of foreign material introduced into the wound, all of which has an important bearing on subsequent wound-union.

The wound is now stretched with the fingers, thereby slightly enlarging it and better exposing the underlying fascia, which, after operation, contract to the original size of the cut. The fascia is next incised in the same direction and to the same extent, 1 to 2 inches above the symphysis pubis. The extent of the fascial incision to either side should be limited by the outer borders of the recti muscles, and if a larger opening is required, the incision should be curved upward or follow the outer borders of the rectal sheaths directly upward, to avoid injury to the inguinal canals. Dissecting the fascial flaps free from the underlying muscles, which can readily be done by blunt dissection with the finger from without inwards (the linea alba must be cut with the scissors), discloses the two recti overlapped by the pyramidali. The right pyramidalis is separated at its outer edge from the underlying rectus, but not from the linea alba, and retracted to the middle line. Under this the rectus is separated from the middle line and retracted outward.

The peritoneum now lies exposed, and the abdominal cavity is opened by a vertical incision. The lower flap is retracted by a self-retaining retractor, preferably that of Doyen, and the upper one by a small movable abdominal retractor.

These are the only permanent retractors required. Of great assistance during the remainder of the operation are two trowels, which make possible perfect retraction in what would otherwise be inaccessible portions of the operative field. These can be made to illuminate many a dark area with light caught by and reflected from their polished surface.

When the operation is completed, the wound is closed in three separate layers—peritoneum, fascia, and skin.

Advantages.—The abdominal opening afforded by this incision is in close proximity to the pelvic organs and directly above them.

The operator works to greatest advantage, as the opening centers the field of operation, and he has free access in every direction without being obliged, as Kelly says, "to work in the lower angle of a rigid 'V'."

Retraction is easy, as the muscles, being freed from their over-lying fascia, are readily drawn aside and can be kept out of the way with the use of very little force on the retractors. As the long axis of the incision runs in the same direction as the pelvic organs, from the adnexa on one side across the fundus and adnexa of the other side, a maximum exposure of the field of operation is afforded by a minimum length incision.
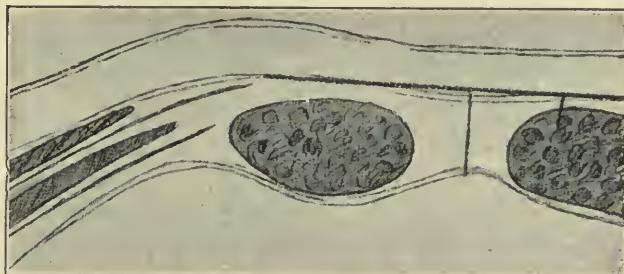
Cross-section of abdominal wall showing path of entrance to abdominal cavity in median line incision and in Pfannenstiel transverse incision. The recti muscles are widely separated and the subsequent strength of the wound depends on fascial union only.

Cross-section of abdominal wall at site of incision showing path of entrance to abdomina cavity by the author's low transverse suprapubic incision. The recti lie close together with no fascial separation and the wound is further strengthened by the overlapping pyramidali muscles. This incision affords the surest guarantee against post-operative hernia.

FIG. 37.—TRANSVERSE SUPRAPUBIC ABDOMINAL INCISION.

The advantages derived by the patient on whom this incision is used are of extreme importance: (1) The comparative freedom from shock and postoperative complications is quite noticeable when using this method after the old median-line incision; (2) the perfect exposure, with the ease of access to the pelvic organs which it affords, greatly limits the amount of intra-abdominal manipulations necessary; (3) the intestines are kept in place, well covered and amply protected

by the upper flap; (4) few, if any, laparotomy pads are required, except in pus cases, all of which items greatly reduce the amount of intraperitoneal traumatism and give a convalescence proportionately smooth.

With the transverse abdominal incision the tendency to post-operative hernia is reduced to a minimum, and I do not hesitate to say that such a complication with the incision which I have described is practically impossible. I have never encountered or heard of a case, and my interest in the subject has made me more than ordinarily vigilant.

The incision is intermuscular, made in the strongest part of the abdominal wall, the lower third of the distance between the symphysis pubis and the umbilicus, a region most abundantly supplied with strong muscular tissue, and one where spontaneous hernia is seldom, if ever, seen. Here the recti, two strong thick muscles, lie close to-gether, and are further strengthened by the overlapping pyramidali. On the other hand, the upper two-thirds of the distance between the symphysis pubis and the umbilicus is, with the exception of the abdominal rings, the weakest part of the abdominal wall, where spon-taneous hernia is often seen. Here the recti broaden and thin out, separating to pass the umbilicus above, and the additional support to the pyramidalis is lost. Hernia here frequently results from the simple separation of the recti and thinning of the fascia of the linea alba consequent to the stretching produced by the enlarged uterus of pregnancy or an abdominal tumor—by all means a region to keep away from and not to further weaken by operative invasion.

To secure the strongest wound after operation, the incision should be made in the strongest part of the abdominal wall, and by a technic that interferes as little as possible with the integrity of the fascia and muscles.

Just behind the peritoneal scar of this incision lies the bladder, which, as it fills, pushes intestines away, preventing them from adhering to the wound. In none of the cases in which I have had occasion to reopen the abdomen did any such adhesions exist.

The drawings show in cross-section the path of entrance to the abdominal cavity in my incision and in that of Pfannenstiel. In mine the recti are close together, the linea alba a line only, and if the intes-tines should work their way through this narrow space between the recti, the pyramidalis would have to be passed before the fascia was finally reached.

In Pfannenstiel's the recti lie farther apart and are not so thick. The linea alba is broad and is cut to free the recti; so, if weakened as a result of the operation, they would more readily yield to any advance of the intestines, and the main resistance of the abdominal wall would then depend solely on the fascia.

It has been my experience that the straight transverse incision severs fewer blood-vessels of any size than the curved transverse or median-line incision, as it appears to parallel the larger vessels in the suprapubic region, and as few are cut, there is a minimum inter-

FULL SIZE
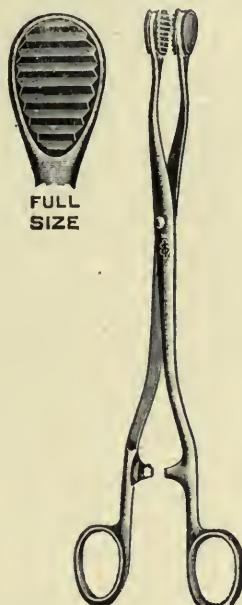
FIG. 38.—AUTHOR'S TUBAL AND INTESTINAL FORCEPS, WITH RUBBER JAWS.

ference with subsequent tissue nutrition, and little necessity for the use of ligatures—two most potent causes of wound infection. Likewise the perfect exposure of, and easy access to, the field of operation limit greatly the traumatism inflicted on the tissues from frequently shifted retractors. The retractor of the lower wound-flap, when once placed, is permanent throughout the operation, while the retractor of the upper flap is not often moved. The trowel retractors, the only ones frequently moved, seldom touch the edges of the wound.

The cosmetic result leaves little to be desired. After six months or a year the fine, unpigmented cicatrix is hardly to be seen, and if situated in the pubic hair is completely hidden from view—a minor point

possibly, but worth considering in patients with neurasthenic tendencies, where a visible abdominal scar serves ever as a constant reminder of the past.

This incision is an ideal one for pelvic surgery in the female.
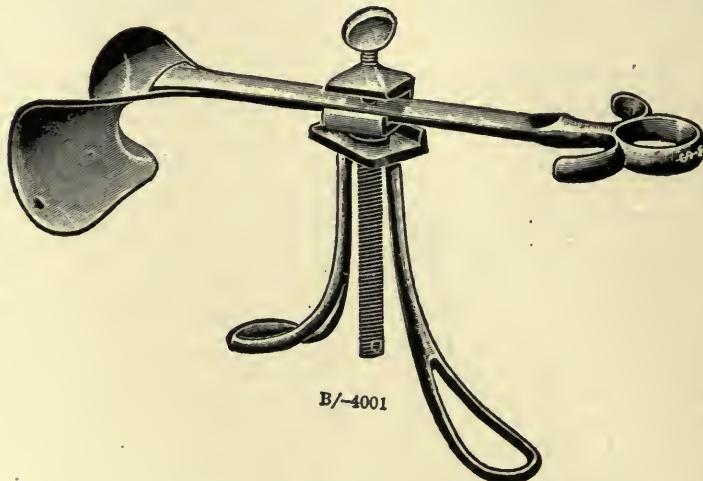
FIG. 39.—AUTHOR'S SELF-RETAINING ABDOMINAL RETRACTOR.

CLOSURE OF THE ABDOMINAL INCISION.—In closing the incision through the abdominal wall after operation, three structures need accurate apposition in order to restore the normal anatomical relations. These are the peritoneum, fascia, and skin. The muscles, provided they have been subjected to no further traumatism than the necessary displacement or separation of their fibers, require no retaining sutures.

FIG. 40.—AUTHOR'S TROWEL RETRACTOR.

In holding the tissues together until union has taken place, it is desirable to use as few sutures as possible, for every one introduced produces some pressure atrophy, is a foreign body, and increases the chances of infection. The sutures should be so introduced as to accomplish their purpose without strangulation of the tissues which they unite, for where the sutures are tied in the wound the nutrition of the

tissues they include is interfered with, and atrophy, if not actual necrosis, results. This is particularly true of the fascia, more poorly nourished, as it is, than either the peritoneum or the skin. Moreover, the tying of knots in the wound greatly increases the amount of foreign material introduced that later must become absorbed or encysted.

TECHNIC.—The peritoneum is brought together by a continuous suture of fine kangaroo tendon. The fascia is united by a running quilted stitch of medium size tension suture material drawing the raw edges together without undue tension, and instead of being tied in the
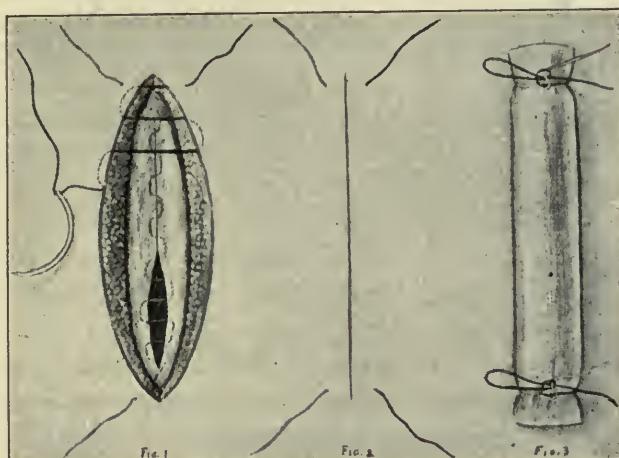
FIG. 41.—CLOSURE OF ABDOMINAL INCISION; AUTHOR'S METHOD. 1, introduction of sutures. 2, sutures ready to tie. 3, sutures tied over gauze.

wound the ends are brought out through the skin and left long near the angles of the wound.

The incision in the skin is closed in the same way by a continuous subcuticular stitch of the same material, and the ends are also brought out through the skin and left long near the angles of the wound, but on the opposite sides from the fascial stitch.

A firm roll of gauze, one inch thick and slightly longer than the wound, is now laid over it, and over this at each end, the skin and fascial stitches are tied together in a bow knot, just tight enough to take up any slipping that may have occurred in the fascial stitch since its introduction. At the first dressing on the third day the gauze between these knots is cut out so as to allow subsequent daily inspection of the wound.

At the end of the second week the knots are untied, releasing the remaining ends of the gauze roller, the sutures cut off at one end and drawn out, thus leaving no suture material behind in the wound between the peritoneum and skin.

In case there is failure on the part of the wound to heal by primary union the skin stitch should be withdrawn and the fascial incision inspected. If this shows infection or if the infection is under the fascia, its edges can be readily separated by loosening the sutures without removing it, and proper drainage secured. Later, when the infec-

FIG. 42.—TRANSVERSE SUPRAPUBIC ABDOMINAL INCISION TWO WEEKS AFTER OPERATION.

tion has subsided and union begun, the edges of the fascia can again be drawn together and good approximation obtained. Thus, the introduction of secondary sutures to close the separation in the fascia so often observed to follow suppurating wounds, and such a frequent cause of postoperative hernia, is avoided, saving much annoyance to both patient and surgeon. This method of closure yields 95 to 98 per cent primary union.

Retrodisplacement.—In a discussion of the operative treatment of retrodisplacement, I shall make no attempt to describe or even enumerate the great number of operations that have from time to time been devised. Many are good; some decidedly bad.

I do not believe in the creation of new supports or attachments for the uterus. The round and uterosacral ligaments are the factors most concerned in maintaining the normal position of the uterus, and are likewise the ones most easy of surgical attack. So long as the uterosacral ligaments hold the cervix up in the hollow of the sacrum, just so long will the fundus remain forward; but when the uterosacral ligaments become relaxed and allow the cervix to swing down into the axis of the vagina, then the conditions are changed, and the fundus, if the round ligaments are not equal to holding it forward, tends to drop back into a position of retroversion or retroflexion. In those cases of retrodisplacement where there is only a slight descent of the cervix the shortening of the round ligaments will usually suffice.

The round ligament shortening may be done by either the abdominal or vaginal route. The shortening of the uterosacral ligament can be done to best advantage only by the abdominal route. Therefore, while I have in the past been just as enthusiastic about the vaginal method of approach as have many of my colleagues, more mature judgment based on a further study of abdominal technic, especially since the advent of the transverse, suprapubic incision, has led me to adopt the abdominal method as the one of election, and I give the following technic as the one of my choice.

OPERATION

With the patient in the Trendelenburg position (45° angle), the intestines will gravitate out of the pelvis, thus doing away with the use of laparotomy pads. A transverse suprapubic incision two inches in length and about the same distance above the symphysis pubis is now made. This is carried through all tissues including the fascia down to the muscles. As the fascia is incised, the sheaths of the recti are opened and the linea alba is seen in the middle of the incision on either side of which lie the vertical fibers of the recti muscles. In about fifty per cent of cases, the slightly oblique fibers of the pyramidali muscles are seen overlapping the recti in the lower and middle third of the field of operation. When the pyramidali are well developed they should be saved, for they are the tensor muscles of the fascia in the linea albi, and their loss may lead later to a wide separation of the recti muscles. The right pyramidalis is now freed from its slight attachment to the

underlying rectus and drawn toward the linea alba. The rectus is then freed from the linea alba drawn outward. This discloses the posterior sheath, which in this location is composed only of peritoneum. The peritoneum is now incised either longitudinally or transversely, opening the peritoneal cavity.

When the patient is properly anesthetized and a full forty-five degree elevation of the table maintained, the intestines will gravitate out of the field of operation in the pelvis, or can be readily made to do so with very little help, so that laparotomy pads need not be used. The use of pads, in other than pus cases, is a needless insult to the viscera, which they are quick to resent, and which is very frequently followed by a stormy convalescence, out of all proportion to the operative indications in the case. The incision is now retracted above and below, any adhesions freed, the adnexa treated as may be indicated and the uterus replaced. Each round ligament in turn is now grasped with a pair of compression forceps at its mid-point between the uterus and the internal inguinal ring and drawn upwards, developing a loop for suturing. With a small, round, pointed needle, threaded with medium size silk or linen thread, the ligament is transfixed about one inch from the inguinal ring and again at its origin from the uterus. Occasionally the origin of the round ligament will vary and it will at times be found to come off low down near the waist of the uterus. When this is the case, the second passage of the needle should be through the uterine tissue, just anterior to the tube, so that when the shortening is accomplished the pull of the ligament will be from the fundus and not from a point lower down on the anterior uterine wall, as this would tend to pull the cervix forward rather than the fundus. The suture transfixes the ligament but does not completely surround it. In this way its nutrition is not interfered with.

The suture is now tied and another one is similarly passed midway between the first one and the end of the ligament loop. This gives a total shortening of the ligament twice the length of the loop, usually from four to six inches. The end of the loop is then transfixed with a suture of catgut or kangaroo tendon, and so sutured to the anterior uterine wall as to bury under its folds the two nonabsorbent sutures with which it was shortened. This is done to prevent them coming in contact with the bladder wall, through which they might easily migrate, and form within the bladder a nidus for the growth of a calculus. When the round ligament of the opposite side has been similarly shortened, it will be seen that the fundus, even with the patient in the

Trendelenburg position, has been brought well forward, where it remains without any tendency to retrodisplacement.

A trowel retractor is now passed along the posterior wall of the uterus and by firm pressure the uterus is carried well forward, especially its cervical portion, when the uterosacral ligaments can be easily demonstrated as reduplicated folds of peritoneum running from the waist of the uterus upward to either side of the rectum. These are
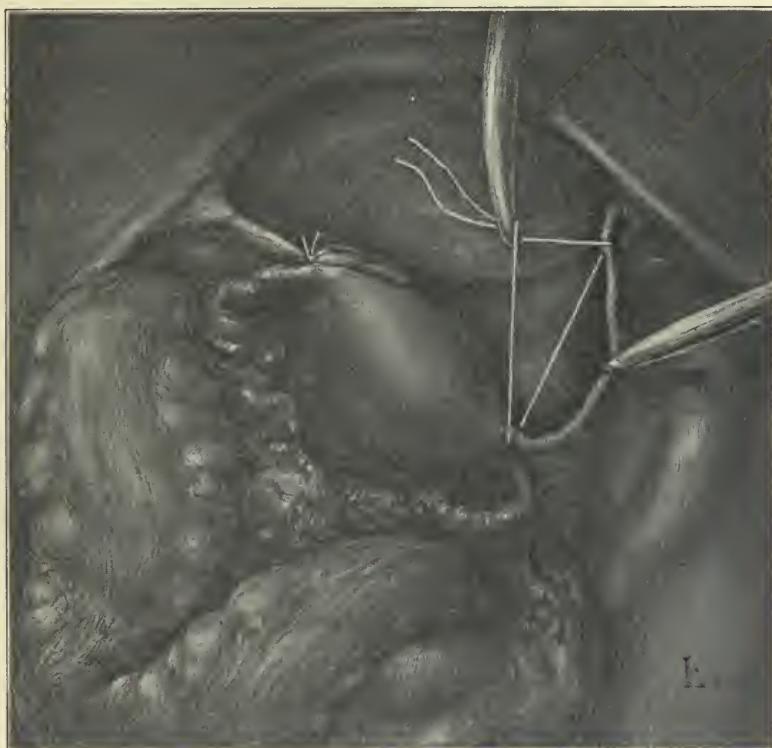
Fig. 43.—Round Ligament Shortening. The left ligament has been shortened and the redundant loop sutured in place. The right ligament is caught up and the first suture introduced.

now picked up in turn, developing a loop about two inches in length. A permanent shortening of each ligament is then made, as in the case of the round ligaments. The operation in the pelvis is now completed, excepting in those cases where a retroflexion has existed for some length of time. In these, the angle of flexion may still persist, even though the fundus has been brought well forward, so that it is necessary to break up the impaction at the angle of flexion by strongly bending the fundus forward on the cervix. This is accomplished by

laying the index finger of the right hand against the cervix and passing the middle finger over and back of the fundus, when by pulling the fundus strongly forward with the middle finger and pressing the index finger against the cervix, the uterus is converted into an extreme anteflexion. When the pressure is released the fundus gradually assumes a normal position of anteversion.

The peritoneal incision is then closed by a suture of fine-sized kangaroo tendon, during the introduction of which the table is gradually lowered to a horizontal position. The fascia, fat, and skin are united by continuous mattress sutures of large-size silkworm gut, silver wire, or preferably one of the substitutes known as tension suture material, manufactured by a number of well-known surgical supply houses. In cases where the uterus is quite large and the ligaments small or the uterosacral ligaments congenitally absent, a pessary should be fitted while the patient is still under the anesthetic. It should be worn for three or four months after operation. Excepting in those cases where a pessary has been fitted, the patient, during her convalescence, should not assume a dorsal position in bed, but should be kept in the face or exaggerated Sims position. When pregnancy occurs, a pessary should be worn for the first four months and again for six months post partum.

MYOMECTOMY

In the surgical treatment of the fibroid uterus the multiplicity of the tumors and the large size of the tumor mass often add very materially to the difficulty of removal. "The larger the tumor the larger the incision," is the time-honored dictum. These operations may be greatly facilitated by decreasing the bulk of the tumor mass as the removal proceeds, and this method of removal means greater safety to the patient.

Ordinarily, these tumors are removed through a large median-line incision, the size of the incision being proportionate to the size of the growth. The intestines are then packed out of the way with laparotomy pads, the uterus delivered, and myomectomy performed. This method of procedure has the following objections:

1. A large median-line incision gives a high percentage of postoperative hernia, both primary and secondary, and there is too great an exposure of the abdominal viscera during the operation.

2. Laparotomy pads traumatize the intestine, adding to the danger of ilius and postoperative infection. Exposure and traumatism of the viscera are of very grave importance, and in every abdominal operation should be reduced to the lowest possible minimum. Laparotomy pads, always a menace to the patient, are unnecessary in most abdominal operations. In the removal of fibroids they constitute a needless insult to the viscera.

My operative technic is as follows:

With the peritoneal cavity open, the wound properly retracted above and below, the pathological condition is studied, and the question of myomectomy decided. The tumor mass is then grasped with two heavy traction forceps, held in close apposition to the abdominal wall and the removal begun. Small tumors are enucleated and removed entire, while those too large to pass through the incision are morcellated. This decreases the bulk of the tumor mass, and, as the operation proceeds, each successive step becomes progressively easier. During the process of morcellation the tumor mass is kept constantly in contact with the abdominal wall. This excludes the intestines from the field of operation, preventing their injury from traumatism or prolonged exposure, and eliminates the necessity for laparotomy pads. As the operation is largely extraperitoneal, the convalescence is proportionately smooth. There is a notable freedom from distention following, and the danger of subsequent adhesions is minimized. When adherent viscera are encountered they are drawn up into the wound and separated under the eye, where they can be easily and safely dealt with. As the morcellation proceeds, the tumor decreases in size, the round and broad ligaments, relieved of tension, relax, and it now becomes easy, if desirable, to deliver the uterus through the wound.

The advantages of myomectomy by morcellation are many. The original morcellation by the vaginal route enjoyed great popularity because of the smoothness of the subsequent convalescence and freedom from postoperative complications, both immediate and remote. The abdominal removal of these tumors by morcellation, now that we have to-day so improved our abdominal technic, gives just as smooth a convalescence and just as great a freedom from complications as was secured by the vaginal operators in the past.

The advantages of the technic which I have above outlined

may be considered both from the point of view of the patient and of the surgeon. To the patient it affords greater safety, a shorter and a smoother convalescence. This is by reason of the fact that as the surgeon works practically extraperitoneally the intestines are kept out of the way without resource to laparotomy pads; thus is the intraperitoneal traumatism minimized and postoperative shock, distention, or peritonitis seldom, if ever, seen. The smaller incision and the stronger resulting scar, especially when the transverse incision is used, reduces to a minimum the danger of hernia. The high percentage of primary union resulting when the transverse incision is closed with non-infectible suture material, means a much shorter hospital residence. A large granulating median-line incision where primary union has not been secured means a prolongation of the convalescence by many weeks, with a good prospect of subsequent hospital stay when the ventral hernia, almost certain to occur in such a case, is repaired.

During the greater part of the operation the tumor is in contact with the abdominal wall, so that the work is largely extraperitoneal. Thus is the surgeon able to see definitely each pathological condition as it arises, and to take the necessary time to meet the indication, for by this technic the length of time which the patient is under the anesthetic is not nearly of the importance that it is when a large median-line incision has been made with all the consequent exposure of intestines and use of laporotomy pads that go with the older technic. Although the transverse suprapubic incision may be so small as to handicap many an operator at the start, still as skill in anything is acquired only by repetition, so here with experience one quickly becomes proficient.

TUBAL OCCLUSION

At the meeting of the American Gynecological Society, held in Chicago, May 24, 1920, I reported seven cases of tubal-occlusion sterility cured by operation. These women subsequently bore eight living children, and five are still in the child-bearing period. In one case the sterility was of seven years' duration, yet the baby was born ten months after operation. Such results as these I feel should go far towards combating the growing pessimism of the profession on this subject.

The more carefully the cases are worked up the less frequent becomes the necessity of depending upon a diagnosis arrived at by

elimination.   Possibility yields to probability, and as our skill in observation and deduction increases, the etiological factor will often be found with quickness and certainty.

Operation.—Through the abdominal incision already described the adnexa are exposed and carefully inspected.   All adhesions are freed and the tubes separated from any pathological attachment and carefully inspected.   Next comes the opening of the tubes, and here variations in technic are at times necessary.   If the tubal end has been occluded from without, as is the case where direct adhesion to the broad ligament or neighboring peritoneal surfaces results from postabortive or postpartum peritonitis, then the freeing of the tubal end at once opens its lumen, disclosing the fimbria, and calls for nothing further.   Where the occlusion is the result of a previous gonorrhea the fimbriae are found drawn into the lumen of the tube and the tube enlarged by the presence of more or less fluid (hydrosalpinx).   A close inspection of such a tube will usually reveal a dimple which marks the point of closure.   At this point the tube can be readily entered by pressure with a pair of small-nosed artery clamps, the fluid evacuated, and then, by separating the jaws of the artery clamp, the slight adhesion imprisoning the fimbriae is readily freed and by milking the tube between the thumb and index finger the fimbriae are readily forced out from the interior of the tube to their normal situation.   Having cleared the end of the tube, a fine-size lachrymal probe or the author's fallopian probe is then passed along the tube and through the cornual end into the uterine cavity, to establish the patency of the canal.   Occasionally the probe will encounter obliterated points in the tube, which, with a little persistence, can be readily passed.   In passing these obstructions, great gentleness should be used to prevent the probe puncturing the wall of the tube.   It is usually better in carrying out this procedure to thread the tube on the probe, which is meanwhile held stationary, than it is to attempt to push the probe onward past the obstruction.   Rarely will it be found that the site of occlusion of the tube is at the cornual end or at any point other than the distal end.   Having now opened both tubes and established their patency, there is nothing further to be done except to ligate the few bleeding points generally found around the opening at the end of the tube where the fimbriae have been freed.   These areas bleed very actively for some time if not controlled by ligatures.   In cases where the disease in the tube has resulted in extensive obliteration of its lumen,

it may be necessary either to remove the obliterated area of the tube or to make a new opening (salpingostomy) in the tube at some point between the uterus and the obstructed area. Personally I prefer the former method, which is carried out as follows:

The obstructed portion of the tube is gradually removed until the free lumen is reached. The diseased portion is now cut away and after it has been established by probing that there is no obstruction in the remainder of the tube, its freed end is slit along the dorsum for three-quarters of an inch. With interrupted
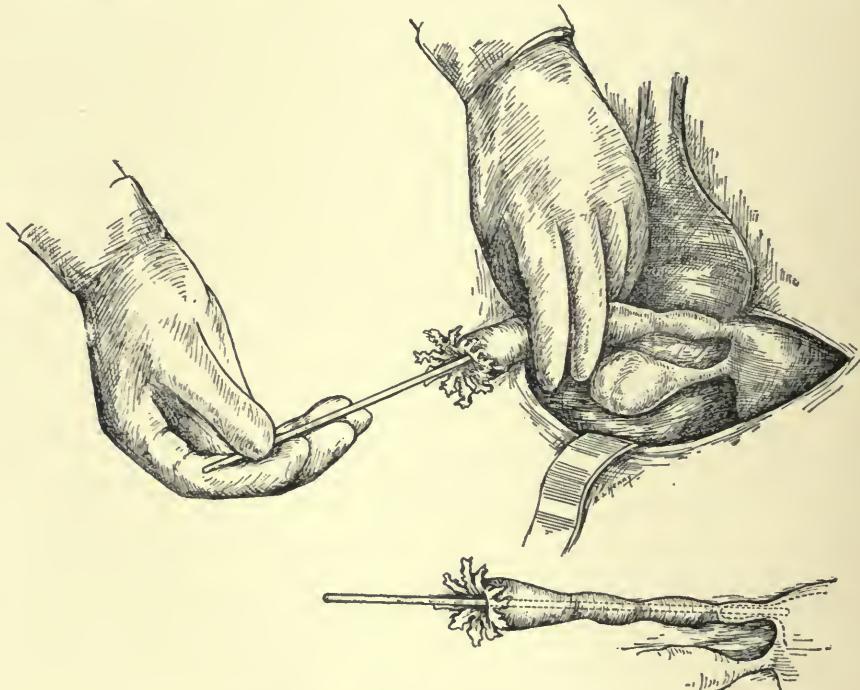
FIG. 44.—METHOD OF PROBING THE TUBE.

sutures of fine silk threaded on the smallest needle, the peritoneal surface of the tube is sutured to its mucosa at a number of different points. In this way we can be fairly certain that the tube will remain patent. In several cases where a tube has been obliterated in its middle third, I have removed the closed section and then anastomosed the ends of the tube over a strand of kangaroo tendon laid in the lumen; in this way hoping to keep the tube patent while the anastomosis was healing. I have never been able to trace a case of subsequent conception following this operation, although there are several instances reported in the literature.

THERAPEUTIC ABORTION AND STERILIZATION

Therapeutic abortion—Therapeutic sterilization—Case history.

Therapeutic Abortion.—Where the life of both mother and child are in danger and it appears quite certain that only one can be saved, the preference should be given to the mother, as her life can reasonably be said to be of greater value to the State than that of her unborn child. Where certain diseases or complications appear during the course of pregnancy that threaten the life of the mother should the pregnancy continue, the consensus of opinion permits and even calls for the destruction of the fetus. When such a condition arises before the child is viable it is designated as prophylactic or therapeutic abortion and is a justifiable procedure in the presence of such serious conditions as hyperemesis gravidarum, and eclampsia, which do not yield to treatment. The operation is always justifiable in certain cases of pulmonary tuberculosis, cardiac disease, nephritis, insanity, and in displacements of the uterus which cannot be corrected. In extreme cases of pelvic contraction where the patient refuses cesarean section, abortion may be justifiable. The results in therapeutic abortion, when carried out with the same degree of skill and care as any other surgical operation, are good.

Therapeutic Sterilization.—Sterilization is often carried out as a therapeutic measure in cesarean section when the operation is performed on account of disproportion incident to contracted pelves. At such times the methods usually employed to prevent further child bearing are removal of the ovaries, removal of the uterus, and removal of the tubes in part or in whole. Simple ligation of the tubes without section is no longer trusted.

Since the importance of the internal secretory function of the ovaries has become established, their removal to produce sterility has been abandoned. When cesarean section was performed the

removal of the uterus, either in whole or in part, was one of the earliest means employed to produce sterility. Porro's operation, and later, supracervical amputation of the fundus enjoyed extensive popularity in this connection. These are now largely superseded by other methods and because of their unjustifiable surgical risk rarely, if ever, used for the sole purpose of preventing future pregnancy.

Therapeutic sterilization is at the present time practically limited to some means of obliterating the lumen of the oviducts. This operation was first performed by Lungren in 1880, who ligated both tubes near the uterus, following a cesarean section. Many failures followed this simple technic, and as time went on resection of a portion of the tube was added. This was not always found to be effectual, and many cases of pregnancy following even the entire removal of both tubes were reported.

The question of therapeutic sterilization is brought forward primarily in women liable to become pregnant and who suffer from some organic lesion which would render pregnancy dangerous to their future life or health.

Heart lesions, nephritis, diabetes, tuberculosis, insanity, and epilepsy are frequent indications to which should be added inability to bear a child by the natural way. It is in the latter class of patients that therapeutic sterilization is probably most often performed, and with many operators it has been a matter of pretty general routine after a second successful cesarean section. However, the danger from repeated sections has been so minimized that it is now no greater than the primary operation, and it seems to me that the decision might well be left to the patient. Of course, when some contra-indication to future pregnancy exists, it becomes the duty of the operator to advise the sterilization, and if during a cesarean section, conditions arise or are discovered that would prohibit further pregnancies, he should be provided with the necessary authority to perform it. I believe that the same rule should hold in all abdomino-pelvic operations on women. The repeated bearing of mentally deficient children should constitute a sufficient indication for therapeutic sterilization.

When repeated childbearing so weakens a mother as to prevent her giving the necessary care to the children she already has, then I believe the indications for therapeutic sterilization should

be broadened to include her. With the birth of each child, the woman's life becomes an increasingly more valuable one and should receive every protection from the State. We know that for many women further pregnancies are simply out of the question. With such it is but foolish to advise continence, for married life without intercourse is hardly to be realized; contraceptives are harmful, uncertain, or both; and repeated abortion offers no solution. The only safe, effectual, and sane methods of preventing pregnancy are by obliterating the fallopian tubes in the woman or by ligating the seminal vesicles in the man. This latter simple operation for the creation of neuters is to be recommended, but does not seem so far to have received the serious attention it really deserves.

Of the various methods of sterilization described and practiced tubal resection in part or in whole is the one most generally employed. This is safe and certain, but attended with the disadvantage that the sterility is absolute and cannot be relieved subsequently should the occasion arise. Possibly this objection is more fancied than real, yet it deserves consideration, for an occasional case is met with when the indications that prompted the original sterilization no longer exist and further children are desired. Likewise, there are women whose mental condition is better after sterilization if they can be promised a reasonable hope of having the sterility relieved at some future time, even though there be but a slight chance of this ever being permissible.

These facts suggest the advisability of temporary sterilization in certain cases and led me a number of years ago to devise a technic that I thought would accomplish the purpose.

The fimbriated end of each tube was buried in a pocket made for it between the folds of the broad ligaments and from which it could be subsequently released in practically normal condition if the occasion should arise. Turenne conceived the same idea independently and performed his first operation in October, 1916, three years after mine. Our methods of procedure were practically identical with one exception—he buried the tubal ends on the posterior face of the broad ligament, while I buried them on the anterior face, leaving the barrier of the broad ligament between the ovary and the site of burial, so that if by any chance an error in technic should leave a small opening from the peritoneal cavity to the lumen of the tube, there would be little

liability of an ovum going over the top of the broad ligament and finding its way into such a small and remote opening. How grievously I failed in estimating the powers of Nature, the subsequent history of my case well illustrates. Because of its intense interest, I give the details in full as already reported elsewhere:

Mrs. L. J. W., age thirty-two years, married eleven years, during which time she had given birth to three full-term children by instrumental deliveries, and had had two miscarriages at five weeks, cause unknown. She presented a lacerated and greatly relaxed outlet with a well-developed rectocele. The cervix was lacerated and hypertrophied, the uterus freely movable in normal position.

At operation on November 15, 1913, the cervix was dilated and the uterus curetted. A bilateral trachelorrhaphy and perineorrhapy were performed. The abdomen was then opened by a transverse suprapubic incision. The left ovary, enlarged, cystic, and prolapsed, was resected. The right ovary and both tubes were normal.

The patient had requested sterilization, which seemed justifiable in view of the three instrumental deliveries for pelvic contraction. This was performed by embedding the fimbriated ends of each tube in a separate pocket on the anterior face of the broad ligament and holding it in place by a continuous encircling suture of fine silk. Convalescence was uneventful.

Normal marital relations were resumed and continued until January, 1916, when she menstruated normally on January 17. The February and March periods were missed, and when I examined her on March 9, the uterus showed enlargement and softening. There had been marked nausea and vomiting during the preceding month with beginning pains in the breasts. A diagosis of pregnancy was made, and on March 11 the abdomen was opened through the scar of the old incision. A transverse fundal incision was then made in the uterus, and an early pregnancy, with numerous old and fresh blood clots, removed. In this no fetus was discovered, but the pathological report returned from the laboratory reported pregnancy. The uterine incision was closed and the proximal ends of the tubes tied with linen sutures and cut, in order to make certain the sterilization attempted at the first operation three years since.

At this time I carefully examined the site of the embedding of both tubes. On the right side there was continuous union between the broad ligament and the circumference of the tube, and at no point could I discover any point of communication between the peritoneal cavity and the embedded ostium of the tube. On the left side the embedding was equally perfect with the exception of just one point anteriorly, where a minute opening, pin point in size, was seen. With a little force this opening admitted the passage of the smallest-sized filiform bougie. Here, then, was the communication between the abdominal cavity and the ostium of the tube, through which the ovum had passed. Nature had proved herself equal to the emergency. The ovum had migrated to the anterior face of the broad ligament and entered the embedded ostium of the tube through the opening described, which was so minute as to be hardly perceptible to the naked eye.

With further experience in therapeutic sterilization I have devised what I think to be a surer and better way of accomplishing temporary sterilization, which is to invert the fimbriae into the tube and close the lumen with purse-string sutures. The operative technic for this method of closure is as follows:

Two purse-string sutures of small-size chromic catgut are passed around the tube one-half inch apart a short distance back from the fimbriae, which are then inverted into the lumen of the tube, and the sutures drawn tight and tied. The site of closure is then touched with tincture of iodin in order to set up a chemical peritonitis at this point so as to make the permanent closure of the tube more certain. By this means we have a method that closely approximates the way Nature seals off the tubes in gonorrhea—one certainly effective—and one that offers a reasonable hope of being able to relieve the sterility in the future should the
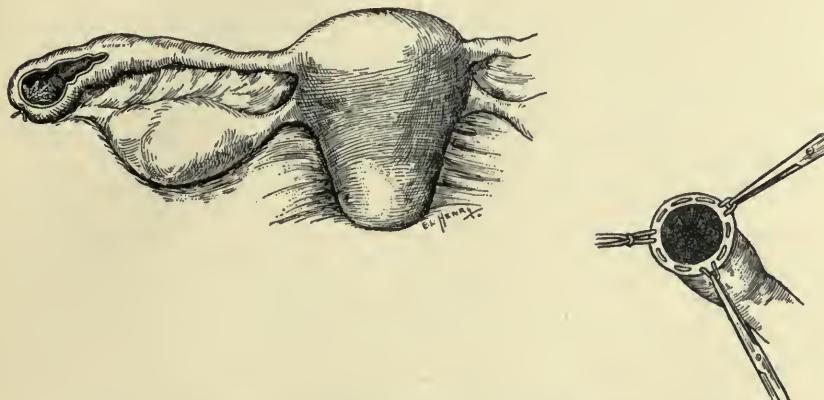
FIG. 45.—THERAPEUTIC STERILIZATION; AUTHOR'S TUBAL CLOSURE.

occasion arise. This technic I have carried out in three cases so far without failure.

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CHAPTER XXV

COMBINED THERAPEUTIC ABORTION AND STERILIZATION

Case histories—Operative technic—Conclusions.

Combined Therapeutic Abortion and Sterilization.—This operation is recommended for patients suffering from serious organic disease where a continuation of the pregnancy would be a serious menace to their life, and with whom the same indication for the interruption would arise in future pregnancies.

Of first importance are the cases with serious heart lesions, notably mitral stenosis, that are prone to attacks of decompensation during pregnancy, or who have had attacks of decompensation at other times. Next in importance come the cases of tuberculosis, nephritis, insanity, and epilepsy.

Sellheim in 1913 was the first to advocate the operation of simultaneous abdominal abortion and sterilization. He reported several cases, using in them all a median-line abdominal incision and a transverse fundal incision in the uterus from tube to tube. Through this incision the gestation was removed, and then one-half inch of each tube was cut away, the tube then being ligated and dropped back between the folds of the broad ligament.

Hoffman in 1914 reported twenty cases, but used a median incision in both abdomen and uterus. In 1914 I reported a case in which the technic of the operation was further improved by making a transverse abdominal incision. Findley, the following year, reported four cases using this method.

The technic of this operation for simultaneous abortion and sterilization is as follows:

A transverse suprapubic incision two and one-half to three inches in length is made three finger breadths above the symphysis pubis. Through this the fundus is exposed to view, grasped at each horn with a pair of traction forceps and drawn up into the

wound. One ampule of pituitrin is now given and its action awaited. In a very short space of time, usually from twenty to sixty seconds, blanched areas appear on the surface of the uterus
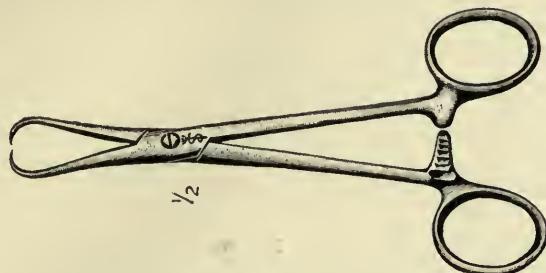
FIG. 46.—JACKSON'S TENACULUM FORCEPS.

and contractions become quite noticeable. An incision opening into the uterine cavity is now made across the fundus from horn to horn. By this time the uterus is contracting so strongly that
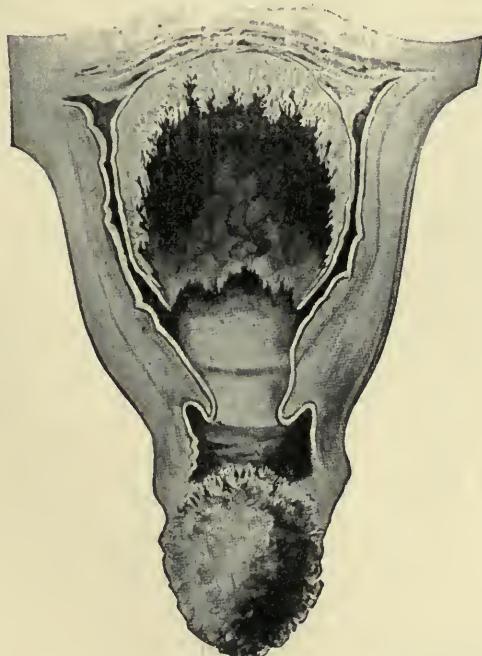
Courtesy of Lippincott.

FIG. 47.—DECIDUAL ABORTION (SHEARS).

as soon as the cavity is opened the ovum is partly extruded. If the operation is performed within the first two months after conception, the ovum can readily be delivered intact. At this period

of pregnancy the decidua constitutes the great bulk of the ovum and to these cases the term "decidual abortion" suggested by Shears is particularly applicable. After about two and one-half months the placental formation is complete; the placenta then forms the greater bulk of the ovum, and uterine attachment is more secure, so that care is necessary to complete its removal. The finger introduced into the uterine cavity separates the ovum, which is then easily removed with the aid of a sponge holder. The whole process of emptying the uterus in this way is astonishingly quick and free from hemorrhage. It is not, as a rule, necessary to pack or drain the uterine cavity. After passing several interrupted catgut sutures through the muscular walls of the uterus to close the uterine cavity and to control any bleeding, the sterilization is proceeded with. This is accomplished by severing the tubes at their cornua, ligating the cut ends with linen or silk, and pushing them down between the two layers of the broad ligaments on either side of the uterus. A continuous suture of small-size catgut now closes the peritoneal covering of the uterus and is so tied at either end as to prevent releasement of the buried tubal ends. Closure of the abdominal incision completes the operation.

The following cases are given as illustrative of some of the more urgent indications for the operation:

Mrs. A. B., thirty-three years old, had been married for eighteen years and during that time had given birth by prolonged labors to four children, the last eight years ago. With each delivery she suffered from marked cardiac involvement that became progressively more serious, and with the last she had a well-developed attack of decompensation. Since then three abortions have been induced at six weeks, the last two and one-half years ago, as her physician felt that pregnancy was a distinct menace to her life. She is now between three and one-half and four months pregnant and has a mitral stenosis with breaking compensation.

On operation at the Polyclinic Hospital, March 14, 1914, a transverse suprapubic incision was made, the gestation removed, and sterilization accomplished through a transverse fundal incision, the uterine cavity being packed. The maximum temperature after operation was 101.2 with a pulse of 102 on the first day. This became normal with a pulse of 98 on the second day, and the wound healed by primary union. The uterine packing was removed on the third day, and the patient allowed out of bed on the seventh day.

Mrs. S. W., thirty-five years old, married fourteen years. She has had three full-term children, all with prolonged labors terminated by difficult instrumental deliveries, and two abortions at five weeks. The childbirth traumatism to cervix and perineum had been repaired three years ago, and sterilization attempted by embedding the tubal ends. She missed two menstrual periods with marked nausea and vomiting for the past month.

Examination showed the uterus to be soft at the fundus and enlarged to correspond with the period of amenorrhea. At operation in the Polyclinic Hospital on March 11, 1916, through a transverse abdominal and fundal incision the gestation was removed and the tubes cut, ligated, and buried as described above. Convalescence was uneventful. The maximum postoperative temperature recorded was 100, with a pulse of 90 on the day of operation, which became normal with a pulse of 89 on the first day after. The wound healed by primary union.

Mrs. R. K., twenty-seven years old, had been married nine years, having given birth to three children, the last two years ago. She is now pregnant for the fourth time, the period of gestation being about two months. She has pulmonary tuberculosis and epilepsy.
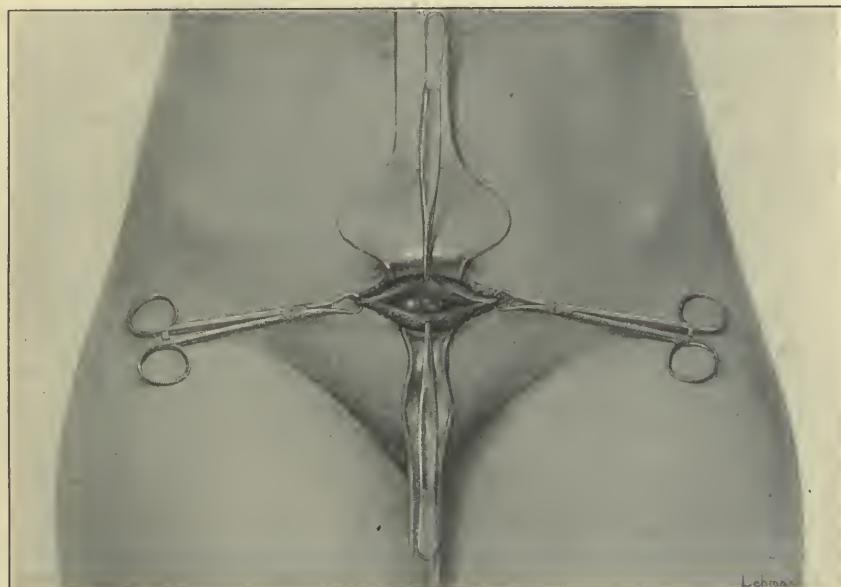
FIG. 48.—AUTHOR'S SIMULTANEOUS ABDOMINAL ABORTION AND STERILIZATION SHOWING: INCISION THROUGH ABDOMINAL WALL AND FUNDUS OF THE UTERUS.

At operation in the Polyclinic Hospital on February 7, 1918, the uterus was exposed by a transverse suprapubic incision, the gestation removed intact through a transverse fundal incision, the tubes cut, ligated, ends buried and the incision closed. Convalescence was uneventful; the highest temperature reached was 101.2 with a pulse of 72 on the evening of the day of operation, which dropped to normal with a pulse of 74 on the fifth day. Wound union was by primary intention.

Mrs. D. R., thirty-two years of age, had been married twelve years, during which time she has had two children and no miscarriages. Shortly after her first labor she developed leprosy. The disease progressed slowly until the next pregnancy, during which its progress was more rapid, but abated somewhat after delivery. She is now about four months pregnant, and the leprous symptoms have again become active. After consultation with her attending dermatologists it was decided to interrupt the pregnancy. Accordingly, on April 7, 1921, at the City

Hospital a therapeutic simultaneous abortion and sterilization was performed by the abdominal route, transverse suprapubic incision, transverse fundal incision, with ligation and embedding of the proximal tubal ends. Convalescence was uneventful, the patient running a maximum temperature of 100.4 on the second day after the operation, with a pulse of 108. On the fourth day the temperature became normal, the pulse 108, and the wound healed by primary union.

Operative Technic.—The transverse abdominal incision has in general, many advantages over the median-line incision which I have taken up fully elsewhere and will not dilate on again here. For the operation under discussion it is particularly well adapted,
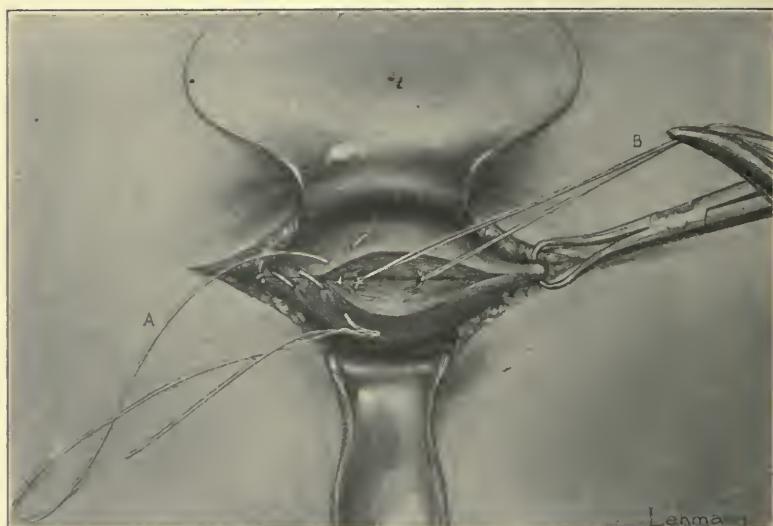
FIG. 49.—AUTHOR'S SIMULTANEOUS ABDOMINAL ABORTION AND STERILIZATION SHOWING A., continuous closing suture in uterine wall cover. B., deep approximating sutures.

allowing as it does the fundus to be drawn tightly into the field of operation, thus blocking off the free peritoneal cavity and making the emptying of the uterus and the sterilization practically extraperitoneal. Both the abdominal and uterine incisions lie in the same line, thus giving a maximum exposure of the uterus with a minimum exposure of the rest of the abdominal contents.

The actual emptying of the uterus is accomplished with far greater celerity and ease through the transverse fundal incision, and additional incisions are not required for the sterilization. There is also much less bleeding than when a median incision in the uterus is used. The reaction following the operation is slight; the four cases reported above showed an average elevation of

temperature of only 2.3 degrees and an average increase in pulse rate of only 13 beats to the minute, which occurred on the second day. The temperature dropped to normal on the third day.

In support of simultaneous abdominal abortion and sterilization, I would urge that it is quick, complete and certain. It is attended by far less risk to the patient than is the combined vaginal and abdominal operation. It should only be done in clean cases, however, where there has been no attempt at interference from below. It is not applicable to cases where even a short anesthesia would be contra-indicated; in these the more conservative treatment of emptying the uterus from below and reserving the sterilization for some future time is to be preferred,
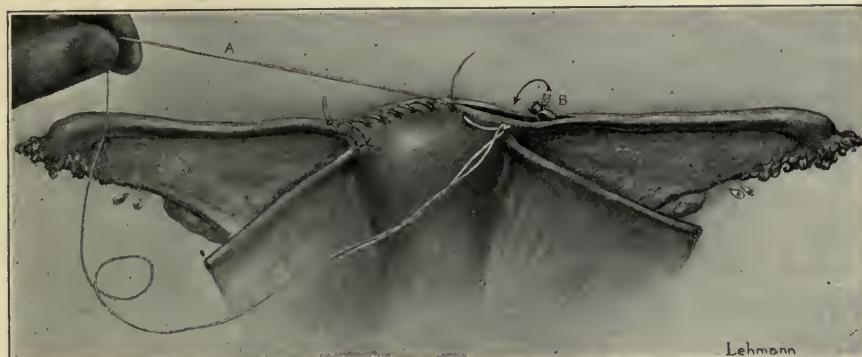
Fig. 50.—Author's Simultaneous Abdominal Abortion and Sterilization Showing Treatment of the Tubes and Closure of the Uterine Incision. A., continuous chromic catgut suture. B., tube cut and ligated. C., tubal end buried.

but only too often when the sterilization is postponed another pregnancy intervenes before it is accomplished, and such cases not infrequently result disastrously.

CONCLUSION

What advice should be given in cases of sterility? This is probably the most difficult question of all to decide. When all examinations have been made and we take up for final review the recorded facts in an individual case, a more or less definite cause for the sterility can usually be settled upon. The treatment for this may be simple and free from danger, or it may be complex and call for operative measures, the carrying out of which would be attended by a very definite surgical risk. In such cases do the

danger and uncertainty of result warrant the surgeon in advising such a risk, or the patient in accepting it? In deciding such a question we have no precedent in surgery to go by, for from time immemorial surgical operations have only been advised to save life or to relieve suffering, where the ethical ground has always been firm under our feet. Now we are facing an entirely new situation. Our position rests on no such firm foundation of fixed opinion, but rather on the uncertain and ever-shifting quicksands of controversial opinion, which is a very different matter. If the assumption of a major operative risk is justifiable in the hope of relieving suffering or of saving a life, is it then also justifiable in the hope of creating a new life? If not, then just how much risk are we warranted in taking in our efforts to relieve sterility? To be sure the question is much simplified in the presence of marked pathological lesions which in themselves are responsible for a certain degree of ill health or suffering, independent of the coexisting sterility, and which call imperatively for surgical relief. But this is only begging the question and helps not at all in deciding what is justifiable in the presence of the single uncomplicated symptom of sterility. I can see but one course that is fair and ethical, and that is to leave the ultimate decision to the parties most concerned. The husband and wife must make the final decision.

In bringing this clinical study of sterility to a close it is with the most sincere regret that I have not been able to present anything like a complete record of all cases of sterility treated, and of the many relieved. Lack of space has prevented the former while the many difficulties of carrying out an adequate follow-up system have made the latter impossible. Though small in number, the cases cited have been carefully studied and followed up, and I feel serve fairly well as illustrative examples of what it is possible to accomplish in the surgical relief of sterility.

I am well aware that many unsuccessful operations have been performed in the past, just as many will be performed in the future. This must of necessity be so in sterility as well as in many other conditions, but as the subject is more thoroughly studied the results will improve and much uncertainty will later yield to certainty. Reproduction is of paramount importance to the race and is a subject worthy of the most careful and faithful study. Every case of absolute sterility cured by operative measures—and

they can be cured in no other way—is a triumph for gynecology. Where the result is the birth of a living child and the fruit of the surgeon's work is carried on to generations yet unborn, then indeed is the triumph great. Surely it would be difficult for any other department of surgery to confer a higher reward on the operator or to show results of greater value to society. It is such results as these that should go far towards creating in the surgeon an added respect for the art he practices and a firmer belief in the value of conservative gynecology.

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